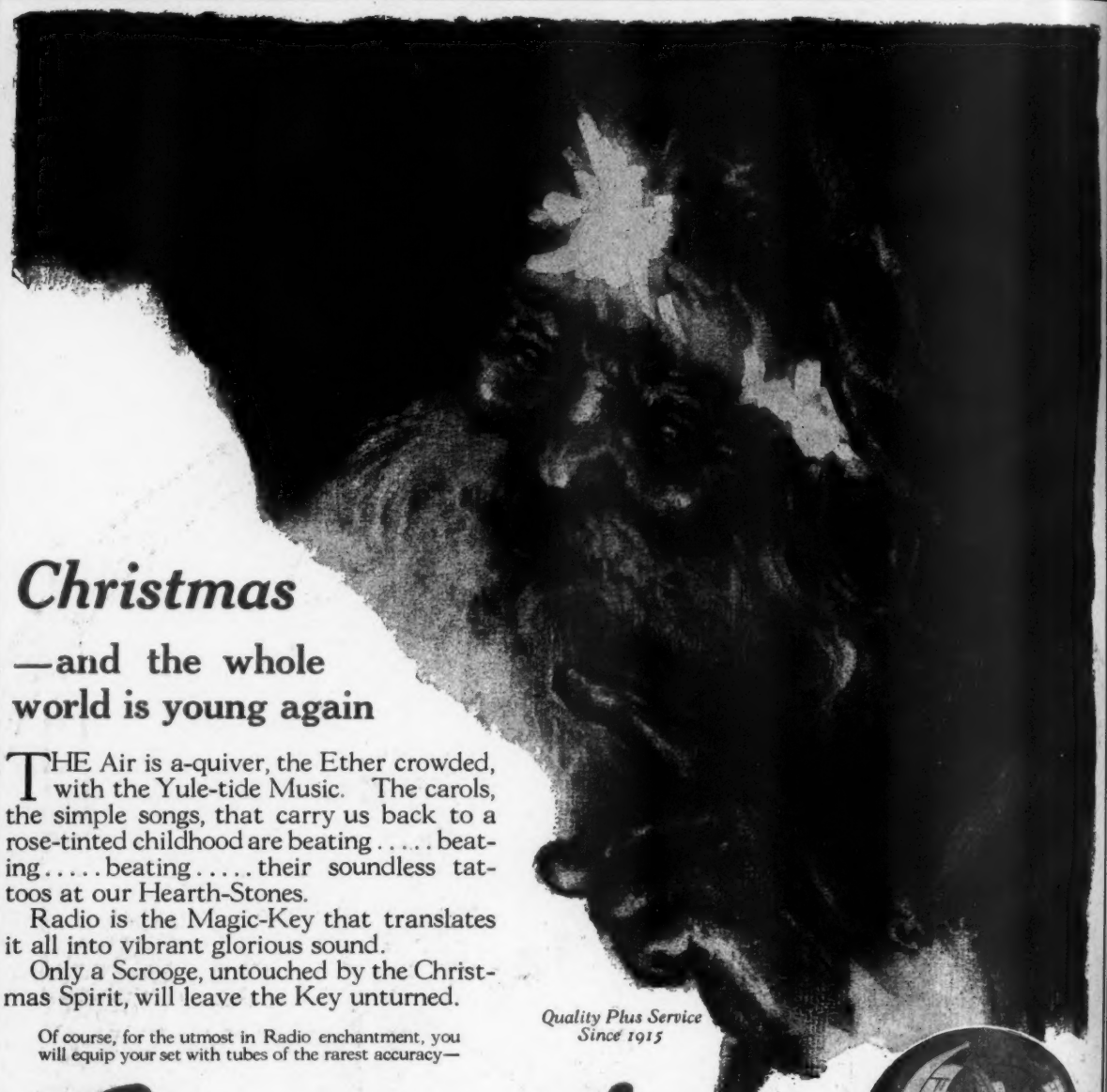
DECEMBER 1924 25 CENTS

Wireless Age ★

The Radio Magazine



Christmas

—and the whole world is young again

THE Air is a-quiver, the Ether crowded, with the Yule-tide Music. The carols, the simple songs, that carry us back to a rose-tinted childhood are beating . . . . . beating . . . . . beating . . . . . their soundless tattoos at our Hearth-Stones.

Radio is the Magic-Key that translates it all into vibrant glorious sound.

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Cunningham 40-page data book fully explaining care and operation of Radio Tubes now available by sending 10c in stamps to San Francisco Office.

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Bring Christmas Cheer from far and near

Think of the little hearts that will beat the faster on Christmas morn on finding in their stocking a gift so pleasing.

If you only will — Old Santa himself from way up North will talk to the kiddies, and stories tell.

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A Gift to Last
Throughout the Year.

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Every set tested and approved by Government Licensed Radio Operators.

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Scientific

"Quality Goods for Quality Readers"

Wireless Age

The Radio Magazine

Vol. XII *No. 3*

December, 1924—Contents

Editorial Chat - - - - - - - - - - - - - - - 14

The Rhythm of Life, *By William A. Hurd* - - - - - - - - - 17

DX, A Yuletide Story of Radio, *By F. R. Buckley* - - - - - - - - 20

The Radio Widow's Plaint, *By Margery Griffin* - - - - - - - - 25

Arthur Stringer's Radio Movie, *By Charles L. Gartner* - - - - - - - 26

John Hays Hammond, Jr., *By Jerome W. Howe* - - - - - - - - 28

My Happy Radio Career, *By Eleanor Poehler* - - - - - - - - - 30

The Ethereal Symphony (A Poem), *By J. W. Taber* - - - - - - - - 31

The Plunketteers, *By Golda M. Goldman* - - - - - - - - - 33

The DX Go-Getter, *By R. A. Bradley* - - - - - - - - - - 34

The Night Before Xmas, *By Mrs. Christine Frederick* - - - - - - - 36

RCA Decorates Radio Heroes - - - - - - - - - - - 37

Super-Power, *By O. C. Roos* - - - - - - - - - - - 38

World Wide News, *By C. S. Anderson* - - - - - - - - - - 42

The Beam System, *By K. M. MacIlwain* - - - - - - - - - 45

Afloat and Ashore With the Operator, *By W. S. Fitzpatrick* - - - - - - 48

The Radio Lyre, *By O. B. Scott* - - - - - - - - - - 49

Mysteries of the Vacuum Tube, *By Donald Gordon Ward* - - - - - - 50

Filament Circuits, *By John R. Meagher* - - - - - - - - - 52

Broadcasting Station Directory - - - - - - - - - - - 53

Information Desk - - - - - - - - - - - - - - 58

Appliances and Devices - - - - - - - - - - - - - 69

Your Authors

ARTHUR STRINGER (Arthur Stringer's Radio Movie) is known in real life as John Arbuthnott. Most readers, however, know him as the Arthur Stringer of author-fame. He has many books to his credit as well as a long series of short stories in our leading publications. In 1906 and 1907 he wrote "The Wire Tappers" and "Phantom Wires," and has recently turned to "wireless" in his latest movie release, "Without Warning." His versatility was exercised without stint in exploiting the "mystery thrillers" of radio.

JEROME W. HOWE (John Hays Hammond, Jr.) is assistant professor of civil engineering at Worcester Polytechnic Institute. His story of John Hays Hammond, Jr., contains intimate glimpses of the man and his work, little known to the public, and of profound consequence to radio and its adherents. And better, the story itself is told with the sense of humor characteristic of the author.

OSCAR C. ROOS, B.S., M.E., Fellow I.R.E. and Pres. R.A.I.L.S. is one of the pioneer professional radio men in the U. S. After working with Shoemaker and DeForest in 1902 to 1904 as designer and installer in the old radio yachting days, he was John Stone Stone's right-hand mathematical assistant and research engineer. In 1909 he was research engineer for Fessenden, and afterward developed the first commercial arc stations at Cleveland and Toledo.

Mr. Roos was in charge of the Radio system in the P. I. from 1910 up to 1917 and developed new receivers and wavemeters during the war.

He is a linguist and musician by hobby and helped to found the Manila Symphony Orchestra, the Society of Wireless Telegraph Engineers, and the I.R.E.

Mr. Roos started the Boston Radio Exposition in 1922 as Technical Director.

He is leading the Ilo movement in North America and is an officer of the International Union for the Adoption of an Auxiliary Language.

PUBLISHED MONTHLY AT WIRELESS PRESS, INC., 326 BROADWAY, NEW YORK

Los Angeles, Calif., 1116 Chapman St., Coast Publishers Co. **Chicago, Ill.**, Wrigley Bldg., Wheeler & Northup. **Boston**, 18 Stewart St., Charles M. White.
San Francisco, 821 Market St., Coast Publishers Co. **Great Britain**, 12-13 Henrietta St., London. **Australia**, 97 Clarence St., Sydney, N. S. W.

Yearly subscription in U. S. A., $2.50—Outside U. S. A., $3.00; Single Copies, 25 cents. Entered as second class matter Oct. 9, 1913, Post Office, New York, N. Y., under the Act of March 3, 1879.

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When subscription expires you will find a renewal blank enclosed. Return with remittance promptly.

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Because certain statements and expressions of opinion from correspondents and others, appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts either now or in the future and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signaling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expression if such should at any time appear herein.

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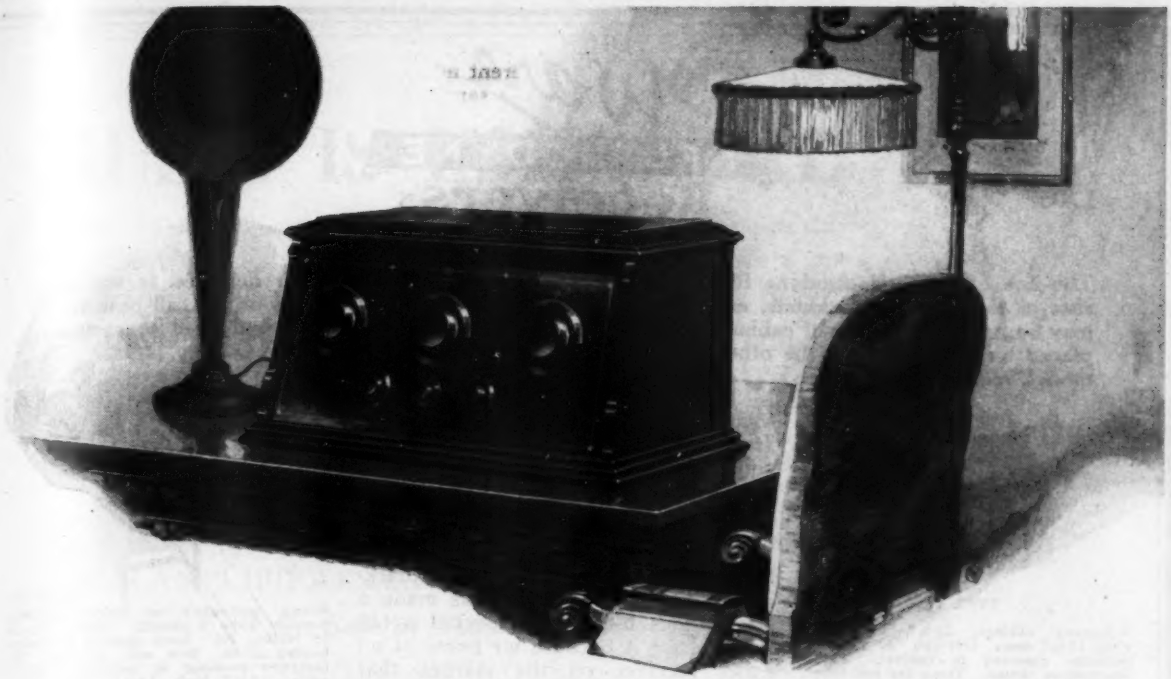


The FADA Neutroceiver

will surpass anything you have expected of a radio receiver

VOLUME? The FADA Neutroceiver will give you all the controlled volume you can possibly desire. Designed to use powerful tubes and operate on either indoor or outdoor antenna, it is guaranteed to give powerful results.

Clarity? This wonderful, five-tube Neutrodyne offers you a tone quality which is unexcelled. It reproduces every tone of the human voice and of every musical instrument with lifelike fidelity.

Selectivity? Separates stations, tunes through powerful local broadcasting and brings in distant concerts—even when but a few meters apart.

Simplicity of control? Anyone, without previous experience, can operate the Neutroceiver. You can turn your dials to previously located stations and bring them back night after night.

Beauty? As a piece of art-furniture, the FADA Neutroceiver is a masterpiece. The cabinet is solid mahogany, with the panel perfectly balanced and sloped gently to facilitate easy tuning.

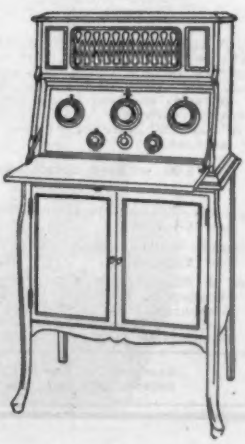
Supplementing the FADA Neutroceiver and making a complete FADA line, are five other Neutrodyne receivers. Six models in all—three, four and five tube Neutrodyne receivers in plain as well as artcraft cabinets, at a price range from $75 to $295. See your dealer.

FADA "One Sixty"
No. 160-A

"The receiver that has taken the country by storm." The best known of all Neutrodynes. Four tubes. Price (less tubes, batteries, etc.) $120.

FADA Neutrola Grand
No. 185/90-A

The five-tube Neutrola 185-A, mounted on FADA Cabinet Table No. 190-A. Price (less tubes, batteries, etc.) $295.



F. A. D. ANDREA, INC., 1581 JEROME AVE., NEW YORK

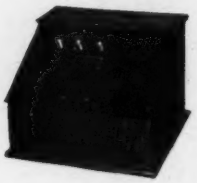
FADA Radio

"Quality Goods for Quality Readers"

Ware NEUTRODYNE Receivers

The line of Ware Neutrodyne Receivers consists of three different circuits, each of which may be had in two styles of cabinets; one to be placed on the table, and the other a furniture model, resting on the floor.

Each of these circuits is designed to suit different needs and conditions, but all possess in the same degree the most desired characteristics in radio—Ware Tone Quality.



TYPE T

Mahogany cabinet, 10¾" high, 14" wide, 18½" deep. Dry-cell "A" and "B" batteries enclosed in cabinet. Reflex Neutrodyne circuit. Three dry cell tubes, one reflexed; equivalent to four tube circuit; one stage tuned radio frequency amplification, detector, two stages audio. Operates loud speaker. Outside antenna.

$65.00 without accessories

TYPE X

Walnut cabinet, 8½" high, 21½" wide, 10¾" deep. Dry cell "A" and "B" batteries enclosed in cabinet. Reflex Neutrodyne circuit. Four dry cell tubes, one reflexed; two stages tuned radio frequency amplification, detector, two stages audio, equivalent to five tube circuit. Double-scaled voltmeter indicates voltages of "A" and "B" batteries. Indoor or outdoor antenna.

$150.00 without accessories.

TYPE W

Walnut cabinet, 8½" high, 21½" wide, 10¾" deep. Neutrodyne, not reflexed, using five vacuum tubes—two radio, detector, two audio—and storage battery. "B" batteries enclosed in cabinet. Double-scaled voltmeter indicates voltages of "A" and "B" batteries. Indoor or outdoor antenna.

$175.00 without accessories.

Ware Tone Quality means—not a different tone quality imparted by the receiver, but exactly the same tones as you would hear if you were actually present where the program is being given.

Type T, which is sold at the remarkably low price of $65.00, has made a tremendous hit. We expected a big demand for it because we knew of no other receiver on the market that would give so much for the money. But the combination of low price, beauty of appearance, Ware Tone Quality, and simple and economical operation has created a demand that has exceeded our expectations. It is the first three-tube Neutrodyne ever made and the first Neutrodyne to be operated on dry cell tubes. One of the tubes is reflexed, on an entirely new principle devised and used only by Ware, giving the full equivalent of a four-tube circuit.

Under each illustration is a brief description of the receiver, but to fully appreciate them, they must be seen and heard.

Stop in at your dealer's and ask for a demonstration of Ware Neutrodyne Receivers. Their performance will be far more convincing than our description.

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Ware RADIO CORPORATION
529-549 WEST 42nd STREET
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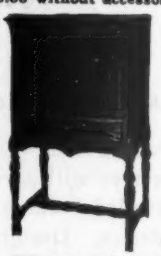
TYPE TU

Brown mahogany or walnut cabinet, housing Type T circuit. Panel exposed by raising lid. Loud speaker concealed behind grille. Dry cell "A" and "B" batteries enclosed in cabinet. Dimensions: 34½" high, 18¼" wide, 18¼" deep. $150.00 without accessories.



TYPE XU

(See WU for cabinet open)
Brown mahogany or walnut cabinet, with panels of contrasting shades. Embodies Type X circuit. Loud speaker concealed behind grille at top, below which a desk leaf turns down, exposing the panel. Dry cell "A" and "B" batteries enclosed in cabinet. Dimensions: 44" high, 27¾" wide, 18⅞" deep.
$275.00 without accessories.

TYPE WU

(See XU for cabinet closed)
Brown mahogany or walnut cabinet, with panels of contrasting shades. Embodies Type W circuit. Loud speaker concealed behind grille at top, below which a desk leaf turns down, exposing the panel. Storage and dry cell batteries enclosed in cabinet. Dimensions: 44" high, 27¾" wide, 18⅞" deep.
$300.00 without accessories.

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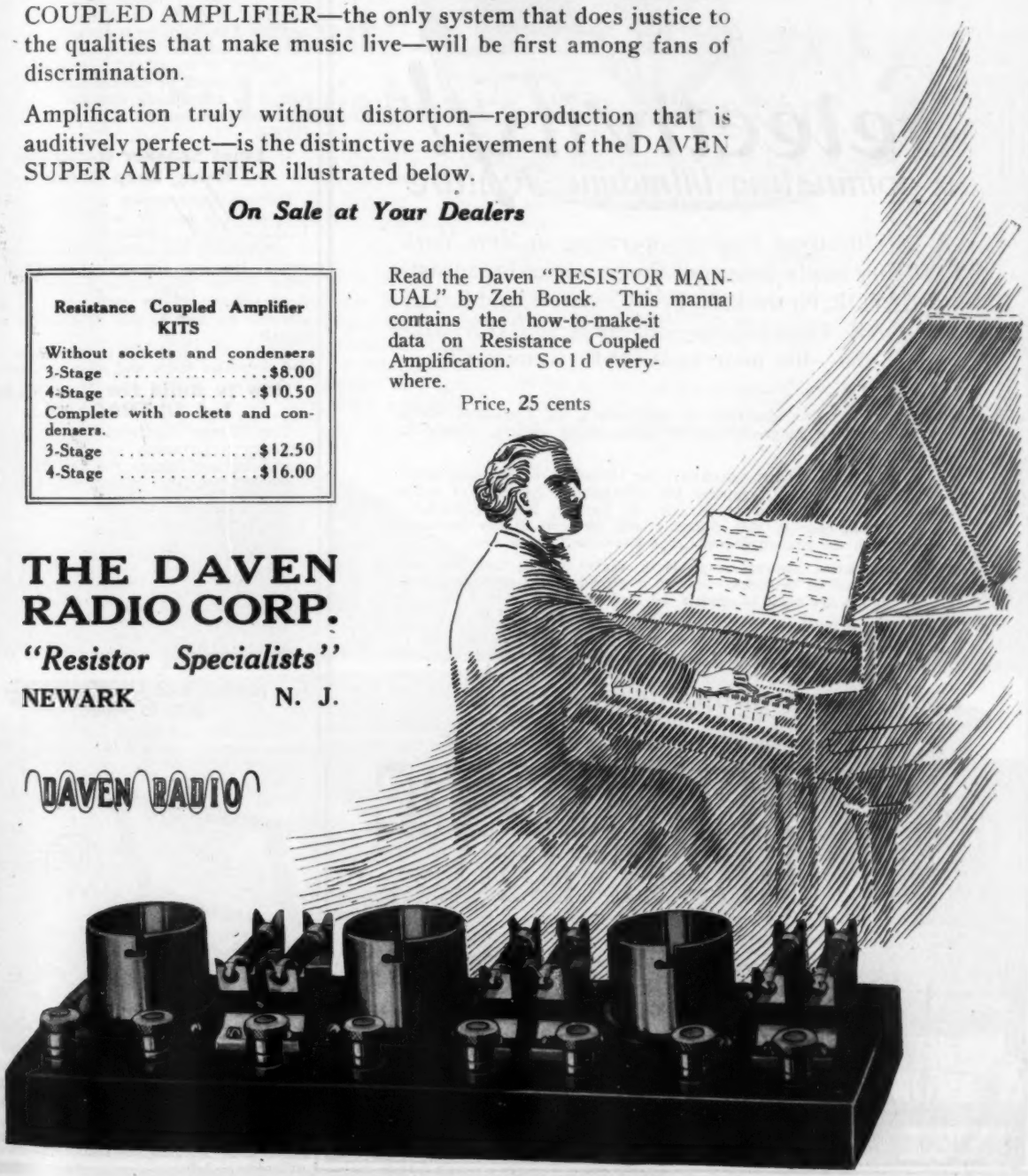

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"Resistor Specialists"

NEWARK N. J.

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Selectivity!
a dominating Ultradyne Feature

AN Ultradyne receiver operating in New York City easily tunes out the powerful broadcasting of WOR, Newark, N. J.—405 meters, and brings in WDAR, Philadelphia—395 meters; PWX, Havana, Cuba—400 meters; WDAF, Kansas City—411 meters.

Regardless of close similarity in wave-length, the Ultradyne selects any station within range—brings in broadcasting clearly, distinctly, faithfully.

In addition to this Ultra-selectivity, the Ultradyne is the most sensitive receiver known. It employs the "Modulation System" of radio reception, the achievement of Mr. R. E. Lacault, E.E., A.M.I.R.E., Consulting Engineer of this company and formerly Radio Research Engineer with the French Signal Corps Research Laboratories.

The "Modulation System" responds to weaker signals than the conventional method of detection—because it provides greater rectification. Weakest signals are made to operate the loud speaker.

Ultradyne performance is the envy of the radio industry.

Write for descriptive circular

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Modulation Plus Regeneration In the New Ultradyne

To the "Modulation System" of radio reception, R. E. Lacault has successfully applied the use of regeneration in the new Model L-2 ULTRADYNE.

The result is ultra-sensitivity never before thought possible. The use of regeneration produces tremendous amplification which is more noticeable when receiving weak signals.

The Radio Section of the U. S. Bureau of Standards has proven by actual measurement that regeneration becomes more effective as the received signal diminishes in strength.

Regeneration applied to the "Modulation System" allows the ULTRADYNE to respond to an extremely small amount of energy. This energy is further amplified thousands of times by the intermediate frequency amplifier before it is detected and made audible. This amplifier is designed for maximum efficiency without decreasing the tone or quality of music and speech.

The reception of distant stations is only limited by atmospheric conditions and causes beyond the control of Model L-2 ULTRADYNE.

Loud Speaker Reception Using Loop Aerial

Efficient loud speaker reception using a loop aerial is possible with the Model L-2 ULTRADYNE. Ordinarily loop reception is considerably less efficient than an outside aerial. However, the application of regeneration to the "Modulation System" reduces the resistance of the loop circuit, thereby allowing the loop to pick up infinitely weak signals.

The use of a loop also increases selectivity and decreases static and other interference.

How to Build the New Model L-2 ULTRADYNE

This 32-page illustrated book gives latest authentic information on drilling, wiring, assembling and tuning the new Model L-2 Ultradyne. This book explains the "Modulation System" in detail and also deals with the application of regeneration to this new system of radio reception.

It is edited by R. E. Lacault, inventor of the Ultradyne Receiver. Price, 50c.

Model L-2 ULTRADYNE Kit Is Ready

This is the new Model L-2 Ultradyne Kit which contains one low loss tuning coil, one low loss Oscillator Coil, one special low loss Coupler, one type "A" Ultraformer, three type "B" Ultraformers, four matched fixed Condensers.

The Ultraformers are new improved long wave radio frequency transformers, especially designed by R. E. Lacault, inventor of the Ultradyne. As a precaution against substitution, R. E. Lacault's personal monogram seal (R.E.L.) is placed on all genuine Ultraformers. All Ultraformers are guaranteed so long as this seal remains unbroken.—Adv.

$30.00

MU-RAD
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Without "A" or "B" Battery St. Louis hears Washington

You can do it with the MU-RAD Type MA-20, which operates without "A" or "B" Battery. Just plug into your electric light socket and tune in.

Mr. L. M. Wood of St. Louis, the first night he had his MU-RAD tuned in Washington, Pittsburgh, Detroit, Chicago, Kansas City, Schenectady and several other Eastern stations, quickly and easily. As he says, "the reception was perfect."

The MU-RAD MA-20 is easy to operate, and the dial readings are always the same for any given station.

MU-RAD Receivers are guaranteed for 1,000 miles reception but records of many times this distance are being broken every day. Ask the MU-RAD dealer in your town to demonstrate it for you.

Write for descriptive literature before you choose all your Christmas gifts. Address, Dept. A.

The MU-RAD MA-20 that operates without batteries

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Tune in
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Micarta is easily machined, drilled and punched. It takes a high polish. It does not expand or shrink due to contact with oil or moisture. *Micarta* can be engraved with great facility, giving clean cut, sharp characters. Ask for booklets F 4566 and F 4621. *Free on request.*

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Westinghouse

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The shell is ORANGE *Bakelite — the base genuine Thermoplax*

The More You Know About Radio the Better You Will Like This Socket

If ever a device were designed to increase the efficiency of all receiving sets, it was this new socket by the Master Builder. Radio engineers praise it —new set builders marvel at its ease of installation and the clear, loud reception obtained that bespeaks the absence of losses—many old-timers have even rewired their sets to establish new distance records and enjoy clearer reception with this better socket.

You'll like its construction, embodying a minimum of both insulation and metal—capacity absolutely minimized *without sacrifice of mechanical strength*. And its base of ebony Thermoplax in beautiful color contrast with the thin shell of orange Bakelite adds as greatly to the appearance of any set as the construction does to its efficiency.

You'll like its contacts (the source of losses and noise in most sockets); they are radically new in design, formed of phosphor bronze and *silver* plated—because the contact resistance of silver does not increase as it stands exposed to air. Then, too, electrical losses are minimized by providing maximum spacing between terminals, both in the insulation and in the air.

You will like the way the tube is inserted and removed without turning—which prevents twisting the bulb from its base. You will like its appearance—its small size—its neatness. You will like its silvered posts with slotted nuts that are fastened *well* with either screw driver or wrench. You will like the way the terminals are arranged for soldering—extra long so that they may be bent down where under-wiring is desired—and provided with ears to hold the wire in place for soldering. And best of all you will like the price, 90c. *This socket that meets the specifications of the most exacting radio engineer costs no more than most of those on the market today!* If your dealer has not yet been stocked, you can be supplied direct from factory at regular price plus 10c for packing and postage.

THE CUTLER-HAMMER MFG. CO.

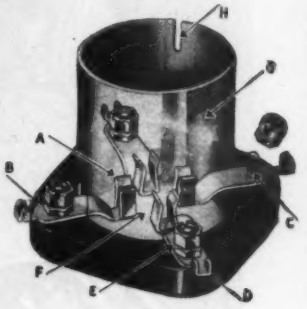
Member Radio Section, Associated Manufacturers of Electrical Supplies

Works: MILWAUKEE and NEW YORK

"Built By The Master Builder"

C-H

These Exclusive Features Assure Better Reception



A

Perfect contact. Both sides of tube prong cleaned when inserted—no contact or wear on soldered end.

B

All metal parts *silver* plated—perfect contact for the life of the set. Silver may tarnish but its contact resistance does not change.

C

One piece contact construction. The binding post is NOT a part of the circuit—the wire to the socket always touches the contact strip which carries the current direct to the tube prong—no joints to cause losses.

D

Convenient terminals for soldering—full length to allow bending down for under-wiring. Ears hold wire in place for soldering.

E

Extra handy binding posts—tight connections with either wrench or screw-driver. Lock washers hold terminals rigid.

F

Wide spacing of current carrying parts both in air and insulation—true low-loss construction.

G

A minimum of both metal and insulation for low capacity. Shell of thin Bakelite—the base of genuine Thermoplax.

H

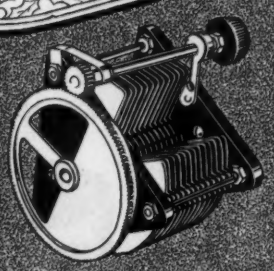
The tube is held in place by merely a vertical motion—no twisting to separate bulb from base.

The attractive orange shell helps identify this better socket, but the famous C-H *trade mark both on the socket and on the orange and blue box is your genuine protection.*

C-H **RADIO SOCKET**

Quality ~ Easily Recognized

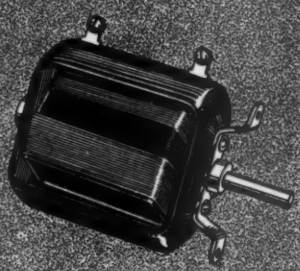
Gifts that will bring joy to any Radio BUILDER



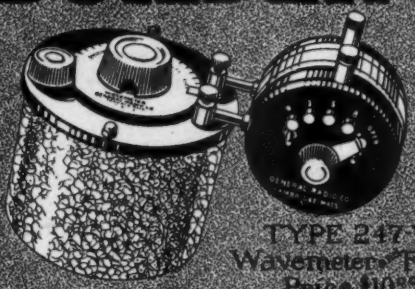
TYPE 247-H
Geared Condenser
Price $5.00

TYPE 231-A
Amplifying Transformer
Price $5.00

TYPE 208
Variocoupler
Price $3.00



TYPE 269
Variometer
Price $5.00



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In selecting articles for Christmas giving, those who choose with the true Yuletide Spirit consider *acceptability* and *practicability*.

To the radio builder who knows the necessity of good apparatus, nothing is more acceptable and practical than General Radio parts, which are scientifically designed by radio engineers.

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A set built with General Radio parts is your unfailing assurance of quality reception. Ask the man who has built one.

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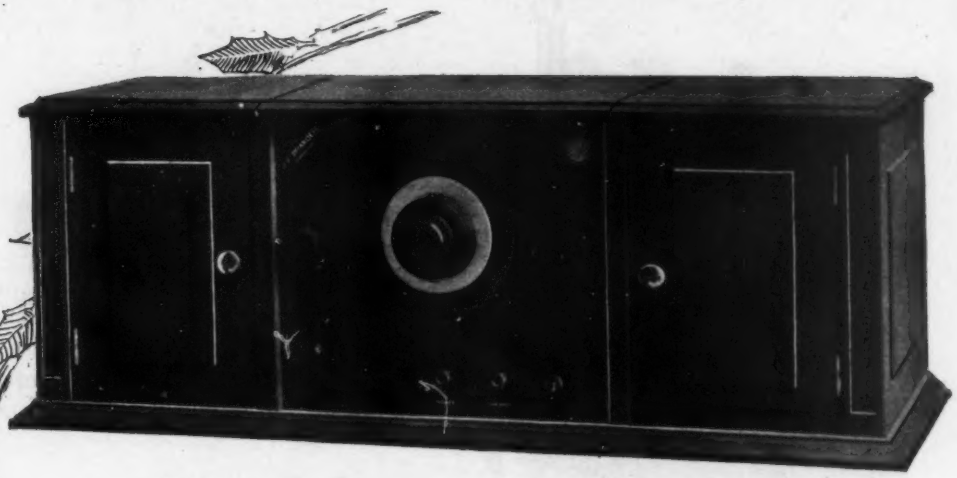

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THE J. F. BRANDEIS CORP.
36 OXFORD STREET NEWARK, N. J.

Editorial Chat

THIS issue of WIRELESS AGE—THE RADIO MAGAZINE—has a cover with a message for you. A message of sincere friendliness and wishes for a happy Christmas.

And it was the thought of holiday carols, expressed in the universal rhythm of being, that will enable you to find lurking in our defense of music—particularly Jazz—The Rhythm of Life.

DX—A Yuletide Story of Radio

The story of an inspiration, born of an idea, and the thought passed along for Yuletide. You'll like Buckley's story for what it is—but you'll have to read it to know that.

Then there is the story of John Hays Hammond, Jr., an ever romantic figure enhanced by the curtains of obscurity thrown about his activities. This, we believe, is the first lifting of the curtains, and the lifting a rather unique episode in radio history.

Super-Broadcasting

The prime factor in broadcast development, scarcely appreciated, and little understood by those of us who toil with an elusive disturbance in the circuit of our pride—the question of super-power broadcasting—has been dedicated by O. C. Roos to whomsoever will comprehend this thing which has loomed up too suddenly for casual, and at the same time, accurate assimilation.

And then, turning the pages, if you build your own, the DX Go-Getter and the Radio Lyre is a combination that you will agree are gems for the technically minded.

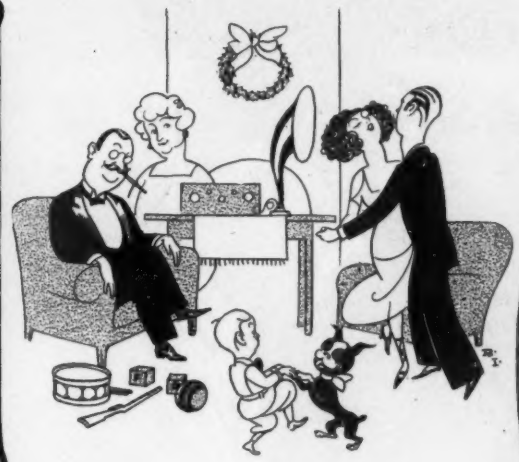
And a Word More—

By way of appreciating our notion of the best to be had in entertainment and culture, you may read The Plunketteers and The Ethereal Symphony, the two related, and yet the one a program schedule of vital importance to music lovers, and the other an inspirational verse on radio.

There is more, for the reading, and you'll enjoy the spirit of friendliness and humor and serious purpose you have come to know as the objective of each number of WIRELESS AGE—THE RADIO MAGAZINE.

And, finally, we wish you—as you wish us—a Very Merry Christmas—Look forward to our New Year Greeting.

—THE EDITORS.



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For a fan who has only headphones—or "just a horn"—a Radiola Loudspeaker is a Christmas inspiration! It means *everybody* listening in—dancing—getting the fun. It means music that *is* music—voice that is human voice—not "radio voice." It means getting the best out of any set.

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The new Paragon line includes the new PARAGON TWO, $27.50, a two-tube set of excellent loudspeaker tone and volume from stations within moderate radius. And the new PARAGON THREE, $48.50, an exceptionally sensitive, fine-toned, three-tube receiver.

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"Quality Goods for Quality Readers"

VOLUME 12

Wireless Age
The Radio Magazine

NUMBER 3

THE RHYTHM OF LIFE

Music hath many charms if we know what it is all about

By WILLIAM A. HURD

RHYTHMIC symphonic syncopation is classical jazz. Why anyone should wish to tie a can on jazz, and give it the gate is beyond me. Jazz is the one contribution to music that distinguishes the American people, and if it is good enough, the name cannot injure its prestige.

When Miss Smith of the Four Hundred marries Mr. Vanrock of Wall Street, Mr. Vanrock becomes Miss Smith's husband and they are known as Mr. and Mrs. Smith-Vanrock. The hyphenated sham is perpetrated on society, because society must maintain its standard. And it is no less reasonable to maintain that classical music is trying to hyphenate jazz by perpetrating the names Syncopep, Polyphonic, Rhythmic Symphonic Syncopation and Syncolyric, than it is to reason as Frank Sullivan, when he said that if fish is filet mignon, then frankfurters can't be.

There is music to designate the varying moods—sadness, meditation, anger—but heretofore none to indicate laughter. The music of Sweden reflects the mood of its people, and in direct contrast, we have the warm, sensuous music of Hawaii. No one could mistake the lotus music of China, nor the tomtom beat of the negro voodooism. The weird rhapsody of Austria is the echo of a Slavic people long since forgotten, and the march of Germany reflects the regimentation of Bismarckism. France and Italy have contributed liberally to musical culture. It has remained for America to contribute laughter to classical music. Jazz is the peculiar, and altogether orig-

inal, harmony that arouses the joy of laughter in an otherwise serious symphony orchestration.

Jazz is produced by a syncopated rhythm overlapping, or lagging behind, a fox-trot four-four time. The result is effective. America's pulse-beat is jazz, and the broadcast stations prescribe accordingly.

Since the radio audience consists of a wide variety of musical tastes, much care must be exercised in selecting balanced broadcast programs. Many of the broadcasters tell me that jazz must be included because jazz is what the public wants. I object to such patronage because I happen to be one of the public, and I cannot understand why I shouldn't have what I want in the way of music without someone acting as though he was doing me a great personal favor. I consider it my royal privilege to listen to what I like, or failing that, to buy a new record for my phonograph.

Josiah Zuro

MY musical education consists of information gleaned from the thumb nail notes on theater programs. I have learned that one who likes jazz would enjoy certain classical renditions, and another who prefers the old minuets would find string ensembles to their liking, just as anyone who most enjoys the martial stirring effect of band music can learn to appreciate the Fire Music from Wagner's "Valkyrie."

With the airways to roam, for the tuning-in, we can all acquire a music appreciation. Jazz lovers would find the Strauss Waltz broadcast by a philharmonic orchestra irresistible, as well as the waltzes and mazurkas of Chopin. The repertoire of Chaminade, the Cakewalk by Debussy, and Schumann's Fantasie have an appeal, and offer a diversion of music that any popular music lover can enjoy, to say nothing of the Toreador Song from the opera "Carmen." Nearly all of the operas contain gay and tuneful passages, approximating or supplementary to the jazz taste.

Liszt took his Hungarian Rhapsodies from the old Hungarian folk melodies, added the fire and fervor of a genius, and left them for those of us who will tune them in. The Largo Movement from Dvorak's New World Symphony, is in reality an old negro folk song, and The Last Rose of Summer was taken from the opera "Martha."

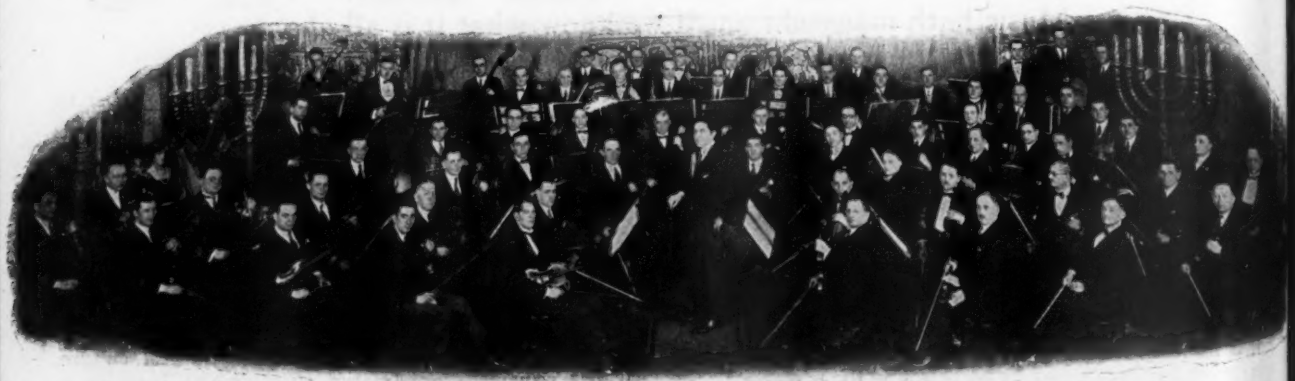
Why, then, if I may be so impertinent as to ask, has anyone the virgin claim to superiority over the plebeian jazz taste of the uninformed public?

With that question in mind, I sought the good counsel of Josiah Zuro, who is the director of presentation at the Rivoli, Rialto and Criterion theaters in New York, and the founder and conductor of the Sunday Symphonic Society. Last year, he broadcast from WJZ, and this year is broadcasting from WNYC. And he knows what and how to broadcast. His programs are of the highest order, though not always serious, but arranged on the premise that all may derive from harmony the same spiritual beauty that they get in church.

MR. ZURO, as a boy of eighteen, was chorus master for the late Oscar Hammerstein's Manhattan Opera Company, a position of importance. This illustrates, in some measure, his wide range of experience and early basic training. As a radio fan, today, he ranks second to none, having a receiver in his office, the rehearsal rooms of his theaters, and devoted to broadcast performing.

"Broadcasting philharmonic and symphony concerts," Mr. Zuro said, over the silver luncheon service of the Hotel Astor, "will educate many thousands who are not able to reach concert halls, and will probably send to those halls many more thousands who would search for good music, if they only knew where to find it."

"How will it educate them?"

"How?" he replied. "First, by making good music

Mr. Zuro's Orchestra broadcasting from WNYC

available in the privacy of the home, and then, by giving a brief explanation of the music played, as well as a thumb nail sketch of the composer—his life and his work."

He paused for a moment, and then continued, "The musician is a representative of the ministry of music, a calling as inspired as any other—inspired profoundly—even religiously. The composer must be receptive before he can work, and the conductor must find the peace and rest of a receptive mood before he can feel the power of orchestration. And so it is that one must be receptive to good music before he can listen appreciatively. This he can do comfortably at home."

Anna Pavlowa broadcast from WJZ and WGY

Mr. Zuro's Sunday Symphonic Society depends entirely on contributions for support, the deficit covered by himself, and the members of his orchestra contributing gladly the precious time left to them on a Sunday. His performances are broadcast. And it is to the radio audience that he confidently looks for co-operation.

"The public's taste," Mr. Zuro answered to my question, "particularly their taste for jazz, is an indication of a musical taste. No one can be superior to musical taste, whatever the form or expression. It is through jazz, and beginning with old-time songs, and the latter-day popular hits, that taste for better music can be developed. But the uninformed must be told, the orchestration explained, and a touch of life added by pointing out the melody and how it can be followed. There is no mystery in classical music. One can understand the most difficult composition, if he knows what it is all about."

AND such was the good counsel I sought, nor was I disappointed. And through radio I have come to know, and understand, good music. My education has only just begun—but it is pleasant—and you, too, can listen in, this Yuletide, with broader vision and deeper feeling. The only requisite, I find, is a taste for jazz, or old-time melodies, perhaps a liking of both, but particularly a good tone radio receiver.

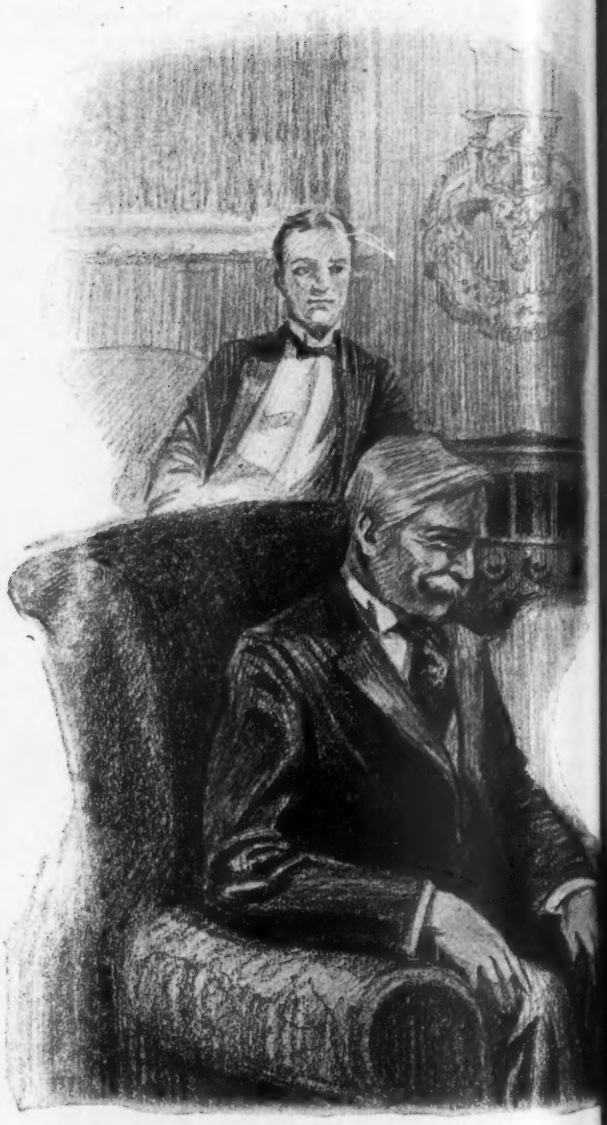
Having listened to the broadcast symphony accompaniment to Anna Pavlowa's performances, I could guess the beautiful rhythm of her dancing and, fancy intrigued, I went to see. Anna Pavlowa, her supporting cast, and the scenic effects were beyond any futile gesture

(*Turn to page* 94)

Humor and Pathos in

DX

A Yuletide Story of Radio



The Romance of

Written by F. R.

Illustrated by

I MAY be seventy-four years of age, and pretty completely paralyzed; I may be almost past all the pleasures of life except sitting in an armchair in the Minotaur Club smoking room; but thank Heaven, I am not deaf (except when I wish to be), and Pete be praised that when I see old Henry Carberry, the King of the Soreheads, get outwitted, I can still dictate the story of it to a pretty stenographer, for the benefit of anybody whose doctor will let him giggle. Mine won't let me.

Have you got that down, my dear?

That's the introduction.

Well, personally, I always rather liked this boy Van Alen, even if he was a radio engineer. I cannot deny that he was terribly tiring with his enthusiasm, and horribly boring with his eternal Van Alen amplifying tube; but after all, enthusiasm is to be expected from the youngest member of any Club; and probably the tube would have been interesting to anyone who knew it from a hole in the ground. The main point is, however, that he never tired or bored me, concentrating all his efforts in both lines upon Mr. Henry Carberry. After all the sore-headed rules Henry had jacked through the house committee, taking away other people's comfort, it seemed like a judgment upon him; in fact Aloysius Jenkins, who had been robbed of his afternoon naps in the dining room, was so grateful that he offered to finance the infernal do-funny himself.

It was now that the young man sprung the first surprise upon us. He refused Aloysius' money; he refused Jim Hawkes' money; and he refused my money, though the Lord knows I have more than I know what to do with. It seemed as though he wanted Henry Carberry's cash in his company, and nobody else's; and while we were puzzling over this strange fastidiousness in one so young, the boy hopped off to do research work or something in Chicago, or somewhere; returning to the Club on the eve of the general annual meeting—last Tuesday in November—apparently an older and a less enthusiastic man.

I mentioned this to him, and said I was sorry to see the change.

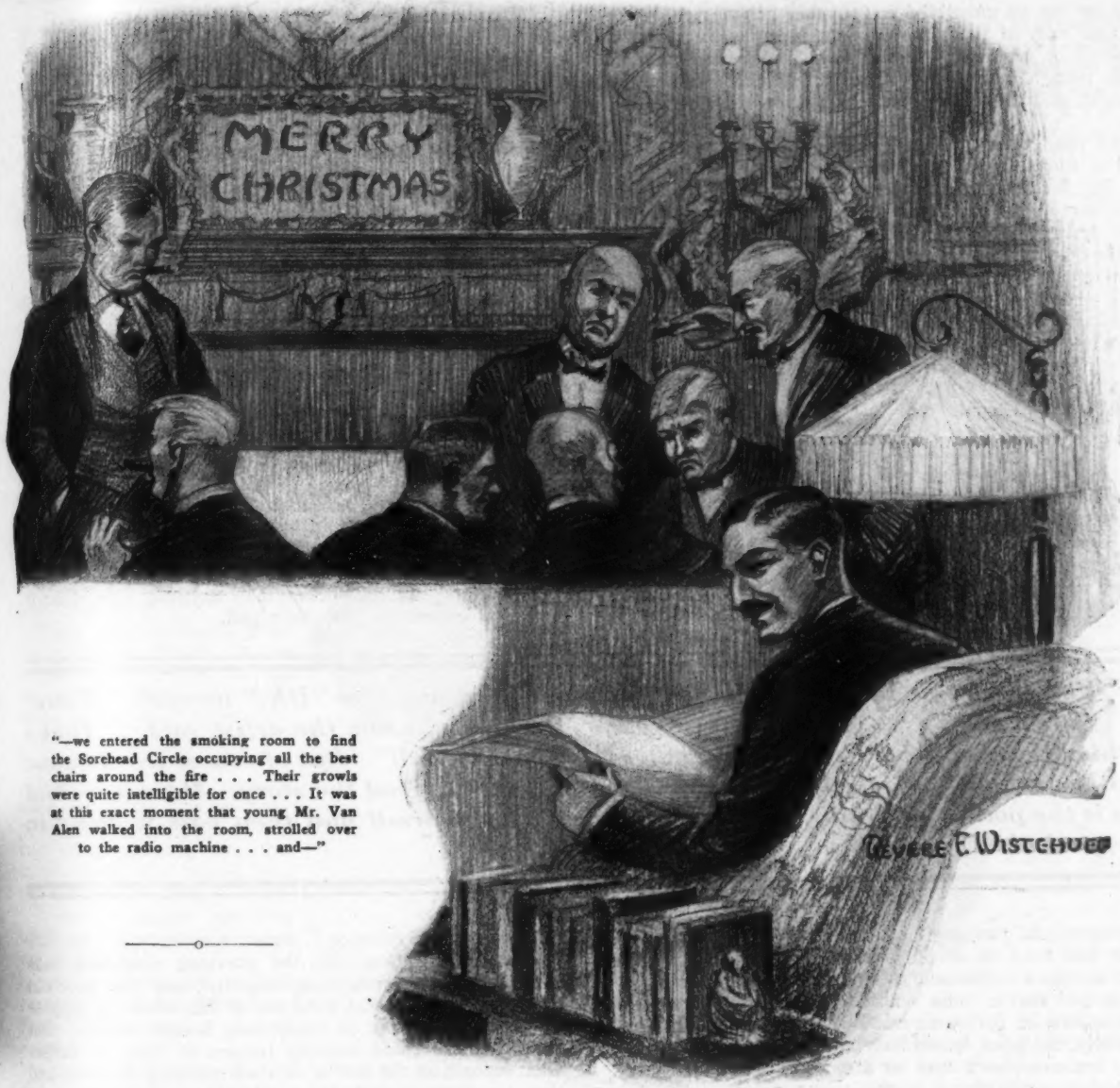
"Why?" he demanded, shoving his hair back off his forehead, and trying to look at me like one of these respectable, world weary clubmen you read about in the books. Naturally, I saw through him. In the first place, there was a twinkle in his eye; and in the second place, if he had really become respectable and world weary, he would have had his hair cut.

Full stop.

"Why," I told him, "since you've been away, old Hen Carberry has been ranging loose and wide, high and fancy, as we used to say out West when a mean pony got going. You know he disinherited his daughter a few years back, because she wanted to go on the stage? Yes. He's sorry now, but he's also obstinate, and anyhow, he don't know where she is, which is why he's so poison mean. Well, he's found five other crabs in this club who are just about in the same fix, and they're running the shebang."

"Organized minority, eh?" says young Van Alen, combing his hair back again with his fingers.

"Organized minority be damned," says I, if you will excuse me, my dear. "They've got rules passed now, so that nobody can talk in this room above a whisper except themselves, and they growl so that I can't overhear a



"—we entered the smoking room to find the Sorehead Circle occupying all the best chairs around the fire . . . Their growls were quite intelligible for once . . . It was at this exact moment that young Mr. Van Alen walked into the room, strolled over to the radio machine . . . and—"

Old Time Rangers Snowbound in a Great City

BUCKLEY at His Best

Revere F. Wistehuff

word. It's unlawful to smoke in your bedroom these days; all dinner checks have to be signed with the full name; and last week they actually put over a by-law barring all instruments of music from the premises. It's seemed to me in the past that you had kind of a war on with Carberry. If you've got any new poison gas, my lad, now is the time to uncork it."

At this moment, Arthur James, who used to be my partner in the J Bar M—my name being Meeks—stopped by and added his plea.

"Every day for forty years," he said pathetically, "I have played 'Nearer, My God, To Thee' on the piano with one finger, at three o'clock p. m. Now—"

He tried to explain himself more fully, perceived that Carberry and all the other disinheritors were staring at him, choked with rage and grief mixed, waved his hand toward the locked piano, muttered something about having a quarter of a million to invest, and went away.

VAN ALEN looked after him for a second; then stared at old Carberry, whose hackles were rising visibly at the sight of him; and then gazed reflectively into my face. It was now that I first got an inkling of that young man's depth. His eyes didn't seem to have any backs to them, if you know what I mean. I can't say I had any suspicion of the extent of his schemes, but I did know, from then on, that there was more in his dealings with Carberry than met the eye—and that there was liable to be more still.

"If I start something," he said slowly, "at the annual meeting, will you guarantee that the decent members 'll back me up?"

"I am but an unlettered cowpuncher grown rich," says I, "and most of them are eminent New Yorkers, but I wouldn't be surprised. Better have something sound in mind, though. Carberry's chairman of every committee in sight, and the other disinheritors are great at voting 'yea'."

The young man got up, grinning.

"I've something in mind, all right," says he.

I did, for a fleeting moment, now suspect that all this —his stirring up of Carberry in the first place; his going away, letting Carberry loose, his coming back in time to get the leadership of all us infuriated members—was part of his plans; but I dismissed the idea as ridiculous.

He seemed so young and so innocent. Ha-ha!

That is a laugh at my own simplicity, my dear—not a death rattle.

Put it in the manuscript.

All right?

Then that's Chapter One.

WELL, in the course of a long experience merging ranches into Beef Corporations, and plain holes in the ground into Mining, Smelting and Refining Corporations, I have seen and performed a few tricks of parliamentary law juggling and meeting-murder myself; but Mr. Van Alen, in his twenty-fourth year, was far beyond anything I ever dreamed of.

He sat in the annual assembly, combing his hair with his fingers and yawning occasionally, until the Sorehead Circle had fired off all its personal measures; and then he arose, like a rattlesnake coming from under a dead log, and moved that a radio set, to cost seven hundred and fifty dollars, be forthwith installed in the smoking room. Normally, the price would have set the meeting in an uproar; but everybody was so intent on seeing Carberry crushed to earth, that it wasn't even noticed. In fact, a notorious tightwad seconded it; and it was just about to be passed by a whale of a majority, when old Carberry arose with his hair bristling, and protested that this resolution conflicted with the one barring musical instruments from the club.

"Is a political speech musical?" demanded young Mr. Van Alen.

"A musical instrument is anything that will produce music!" snaps Carberry.

"Then we can have no carpentry work or repairs on the building in future," says Mr. Van Alen, combing his hair and reaching behind his chair. "A carpenter's saw is a musical instrument. I am prepared to prove it here and now by playing 'You Can't Have Your Own Way All The Time' on one."

"Vote!" shouts somebody, after a snicker had subsided.

It was carried, one hundred and ninety-four to seven.

Carberry counted the ayes as if every one gave him a separate pain in the neck.

"As treasurer, I have no power—" he began—though he ought to have known considerably better, a veteran company-wrecker like him. A crab at a meeting, like an angry man at a fist fight, never does himself justice.

"That reminds me," says young Van Alen. "Move the treasurer be instructed to pay out seven hundred fifty dollars to the General DX Tube and North American Radio Company, for radio set aforesaid."

"Seconded!" I piped up.

"Vote!" booms Arthur James, viciously humming "Nearer, My God, To Thee" under his breath—it was three o'clock.

Old Carberry stood at the head of the table, perfectly pale with rage. He swallowed at least four large chunks of fury before he could say anything, and then his voice was more like a snarl than a human remark.

"Is the treasurer not to inquire," he demanded, "into the reliability of this alleged radio concern?" It may be one of the fly-by-night—"

Van Alen bobbed up again.

"Ask for vote of confidence by acclamation in the General DX Tube and North American Radio Company," he said, smiling around cheerfully, and retrieving a kiss-curl that had fallen into his right eye.

"Who are they?" growled Saunders Massingtree.

"Me!" says Van Alen.

He got the vote by acclamation, all right. It broke two lampshades; and I should like right here to remark, my dear, if you can get it into that page of your notebook, that while humanity may let on that it admires piety, honesty, and humility better than anything else, what it really reverences is just plain gall.

WHEN the artist returned the manuscript and drawings for "DX," he said: "There! is a real story . . ." And then we told F. R. Buckley what the artist said. "That's nothing," Mr. Buckley replied. "I knew it before he did!" But of course we discount that last remark because Buckley had the first chance to read the story. However — and this is the point — it is up to you to read the story yourself and then pass it along in the good old Xmas spirit.

"Vote on the question!" shouts somebody.

The authorization, like the previous resolution, was carried by an overwhelming majority; and then poor old Carberry really almost went out of his mind. I suppose he thought he was so completely beaten already, that nothing more could possibly happen to him, no matter what he said or did; so he finished counting the vote, and then burst into a perfectly terrible tirade. My stenographer being young, and not too deeply rouged to blush, I cannot repeat the bulk of his remarks; but he ended by saying that no mortal power should cause him to let the radio, when it was installed, interfere with his comfort, or that of his friends, in the slightest degree.

Upon which Van Alen arose and put through a resolution requiring any member who spoiled others' pleasure in the machine; or who turned it off without permission of a majority of those present in the smoking room; or who damaged it in any way—to pay a fine of twenty dollars for each offense, in addition to paying for the repair of any damage.

"I think our investment in this machine," says he, blandly indicating Carberry's trembling anger to the rest of the membership, "needs protection. Besides, the fines will help pay for the installation."

Apparently the others thought so, too; and after they had registered this opinion in the minutes, the meeting adjourned. I spent perhaps a quarter of an hour, after it was over, sending page-boys in search of Van Alen—wishing to offer him a ten thousand dollar job handling the board meetings of my various corporations; but he was not in the Club.

I DIDN'T see him again, until I was wheeled into the smoking room next afternoon at my usual time, and perceived him, in a pair of overalls and a high condition of perspiration, in the act of crawling from under an object like a large folding bed, which had sprung up during the night in one corner of the smoking room.

"What price this?" he demanded, brandishing a screwdriver as I motioned my attendant to wheel me over.

"Seven hundred and fifty dollars."

"I mean," says he, "did you imagine a Gothic cabinet like this, for the price? Look at all the angels and things on it! I've cut my profit down to forty per cent. on this job, just to do the club a favor. See this cherub with the cocked eye? I'm going to have a wood-carver come up and put a bunch of thunderbolts in his left hand, and he'll be a dead ringer for the Spirit of Wireless Telegraphy."

There were, indeed, a great many wooden figures on the cabinet; all flying around in an energetic manner which made me feel slightly weary.

"Is it in working order yet?" I asked, closing my eyes.

Instantaneously, it seemed, some enormous and ill-mannered giant with a lot of trucks and things rattling over his tonsils, came and roared into my ear the following words:

"—and I assure you that while meeauow Senator is in the graaaa best of faith, he is not to be trusted with a common nickel the Saxophone Fools, WJA speaking part of a dollar."

Thinking that I was about to have a second stroke then and there, Mr. Van Alen turned the machine off.

"That's my own patented DX tube, in that," he confessed—or rather boasted. "Now, you come to it free from preconceived notions; with your mind entirely clear of pickles, and competitive claims and so on. Don't you think it's wonderful?"

"It has accomplished marvels," says I, alluding to its having made me sit bolt upright unassisted, for the first thirty seconds in the last thirty years.

"It will accomplish more," says Mr. Van Alen, with a meaning look which I somehow connected with Henry Carberry—he had just come in. "It—".

Combing his hair out of his eyes some more, and absently taking a girl's picture out of his overalls pocket and putting it in his shirt, he looked at me as though wondering whether or not to go on.

"Just you wait until Christmas Day," says he, finally; and with those enigmatic words, walked out of the room.

Henry Carberry, examining the machine a few seconds later, and accidentally touching something that made it blow a trombone in his left ear, said—

But never mind that, my dear.

That's the end of Chapter Two.

"Daddy!—This is for you, Daddy!"

I KNOW I said this was going to be a Christmas story. I know we're still in November. Of course I do. Who should know better? Who's dictating this narrative, anyhow? It's paralysis that ails me, my dear—not paresis.

Very well, then.

Full stop.

Naturally, after Van Alen's remark that Christmas Day would see something unpleasant happening to Mr. Henry Carberry and Co., I and the dozen or so persons to whom I imparted the information, could hardly wait for the days to pass—not that our impatience made any noticeable difference in their speed. During the intervening period, Van Alen and his radio together carried on a sort of guerrilla warfare against the soreheads—slight, yet annoying; for instance, Carberry interrupted a bedtime story by smashing six vacuum tubes, only to find that they cost fifty dollars each to replace—they were Van Alen's patent, at present made by hand in the absence of special machinery, and consequently expensive. Having paid the three hundred dollars, he learned that exactly fifty per cent. of this amount would go direct into Van Alen's pocket, as royalties; and immediately conceived the beginnings of a respect for the young man. Not that he liked him any the better for this. On the contrary. Proverbs to the contrary notwithstanding, the more one respects an enemy, the worse one automatically hates him—in self defense.

Full stop. Paragraph.

"Better watch your radio machine," says I to Van Alen, on the 20th of December, "Carberry and those two friends of his who got fined for turning it off, are in such a state of mind it's liable to be found busted some dead of night."

"Just what I've thought myself. That's why I've hired a page-boy to sleep on the lounge beside it, every night until Christmas."

His eyes met mine as he said this, and once more I was astounded at the entire impossibility of seeing into his soul through them. Mentally, I increased my offer for his services, to twenty thousand dollars a year; but I said nothing about it, being convinced, by this time, that he was quite capable of plotting himself into much more.

"You seem particularly keen on having the set in working order on Christmas Day," I remarked.

"I am," says he, unemotionally.

"Which is the more peculiar," says I, "since you well know there will be nobody in the Club except seven crabs and a few old cripples."

"Who are the other cripples?" asks Van Alen, smiling at me as he evaded the explanation.

"They will gather together," says I vaguely, "if there is anything to be seen."

He surveyed me for another ten seconds.

"Well, you can issue invitations if you like," says he; and with that, and another smile, stalked out of the smoking room.

ACTING on this permission, I booked Arthur James, Saunders Massingtree, Bill Light, and two others, for Christmas dinner at the Club—to be followed by a massacre of some kind; and in due course—on Christmas evening, that is, with a blinding snowstorm swirling around Madison Avenue outside the windows—we gastronomically did ourselves proud. As to the massacre—well at first we thought that was going to be a complete failure. Discussing what form it was likely to take; drinking a few healths to the days when we were all together in the West, and so on and so on, kept us rather long at the table; and we entered the smoking room to find the Sorehead Circle occupying all the best chairs around the fire.

Furthermore, far from being massacred, they were apparently in finer fettle than usual. Their growls were quite intelligible for once. God knows I was at least ten yards from the hearthrug; yet I could distinctly hear old Silas Woffington narrating how he showed his son the door for getting lit once.

"I said 'You have disgraced me,'" says old Silas. "'You are my only son, but never let me look upon your face again!' And—he never has. I guess he knows better!"

"I guess so!" rumbles Mark Swayer in a savage manner, from the other side of Henry Carberry. "I guess my son knows better, too!"

Us other old men on the other side of the room looked at each other and winked.

"Fierce, tonight, ain't they?" says Arthur James, who has never had any children.

"They're afraid not to be," says Saunders Massingtree, who has been blessed with six bums, and raised all of them. "They know darn well that Christmas time 'll get them, if they don't watch out. They're shoutin' to drown out the noise of the sleighbells."

It was at this exact moment that young Mr. Van Alen walked into the room, strolled over to the radio machine, twiddled a few dials, and started it going. There was nothing on the air—to use a technical expression—at that moment, apparently; but that made no difference to the Sorehead Circle. As one man, though, led by Henry Carberry, they arose and demanded that the machine be disconnected.

Van Alen counted noses.

"You gentlemen in favor?" he asked of us—all.

"Sure! Let her rip!" says Arthur James.

There were seven of the soreheads. There were seven of us; and Van Alen himself made eight.

"Once more, you're voted down," says young Van Alen to Carberry. "Better accept the inevitable. It'll only be a few carols anyhow."

"Damn your carols!" shouts Carberry.

We all sat amazed for a few seconds after Carberry had bolted down the stairs—

Van Alen didn't budge.

"I shall be over there on the lounge, if you need me," he remarked coolly.

Henry Carberry gasped.

"*I* need you?" he got out finally. "*I* need *you?*"

"I said 'if'," Van Alen told him. "'If'—or 'when'."

AS he started to walk over to the lounge aforesaid, some hoarse-voiced person said something about WXGZ, and in another instant, off went about a hundred voices into "Good King Wenceslaus." There wasn't any static in the air that night, I guess, or whatever it is; the voices were wonderful, and—well, me, I remembered hearing that carol coming out of a little prairie church once; when I was riding herd in the old days, with a girl's picture in my left hand breast-pocket like Van Alen now had; and for some minutes, I kind of didn't pay any attention to the Sorehead Circle. Some cigar-smoke had got into my eye, anyhow, so that I couldn't see very well for the watering.

But when Arthur James had given me second go at his handkerchief, and the choir had stopped singing, I looked across at them! and dog bite my ear, if they weren't still doing business at the old stand, as crusty and as mean as ever; the whole seven—no, six, of them. Silas Woffington appeared to have left during the singing; probably too mad to sit still, I then thought—though I have since changed my opinion.

However, the survivors were making up for him. While the radio was silent, Mark Swayer started out in a loud voice, boasting about the way he hadn't stood any nonsense from *his* son, twenty years before; and he continued to yarn after "While Shepherds Watched Their Flocks by Night" had started—dodging the fine by kind of whispering, while all the others bent their sore heads towards him.

There was a disgusting spectacle, if you like! I wasn't in the least surprised when old Monroe Barrett suddenly got up and left. I thought he must have been overcome by sickness—though I've since changed my opinion about that, too.

"And then there were five!" says Saunders Massingtree through his cigar. "And four of 'em darned shaky, if you ask me!"

(*Turn to page 62*)

THE RADIO WIDOW'S PLAINT

By
MARGERY GRIFFIN

Who objects to being married without a husband—or at least, a radio husband —which amounts to the same thing

But

Anything that can make a man forget his food and drink, and his dirty old pipe and sit turning little black dials for hours, is indeed wonderful

I AM a radio widow. In case the gentle reader does not know what the term means and implies, I will pause to explain that a radio widow is a woman who has had the misfortune to be married to a radio bug. Surely of all the hobbies a man may have, and a wife must—patiently or impatiently, as her disposition dictates—endure, radioing is the worst.

Even a golf widow is better off it seems to me, for at least she has a square inch of her home which is not strewn with loops, leads or aerials, nor yet with variocouplers, condensers or spaghetti. The golf widow may in fair assurance scrub her kitchen floor with the knowledge that it will not be spotted a few hours hence with drops of shellac, paraffin or solder. She has her griefs, you may be sure, for she must needs find amusement for herself during many long hours while her lord and master is chasing the little pill merrily over the green. Then they tell me you can't play golf after dark, but radio-ing—! The fever is highest after nightfall. But ah! In her home the sweet harmony of silence reigns, she need not start and tremble at a terrible voice that comes booming through a great black horn, or squirm uneasily at a rasping tone which announces, "This is Radio"—squack—"A. B. C."—squee—"announcing. You will now have the pleasure of listening to"—awk—"Miss Dotty Doolittle sing"—yeow-wee-e! We will never know what Miss Dotty Doolittle sang. Sometimes we do not care.

People have said to me, "Isn't radio marvelous? Isn't it wonderful?" And I have replied, "Yes indeed." Wonderful? That is the word. It *is* wonderful. Anything that can make a man forget his food and drink, yea, even his dirty old black pipe, and sit as one in a trance, turning little black dials for hours upon hours, while terrible noises issue forth as something in dreadful agony, is, indeed, wonderful. Anything that can keep a husband up to solder little bits of wire together and wind little round gimmicks with fine copper wire until a cold dawn begins to break, is wonderful. Better, it is marvelous!

Approach that same husband on the following evening thus, "Dearie, don't you think you'd enjoy a good show and supper afterward? I'd just love it."

The suggestion is met with a glance of pitying scorn. Friend husband gives you a look which plainly says, "I am dealing with a woman, I must be patient." But he only says, "You don't seem to realize that I am a working man and must have my sleep. I can't carouse around all night and expect to do a good day's work afterward. I have an early train to make tomorrow." And he sighs at the utter hopelessness of reasoning with a woman, and turns again to the piece of bakelite into which he is drilling a lot of little holes. If all goes well, he may be in bed by 2 A. M., but I wouldn't bet on it.

Let the scene shift to a balmy summer evening. The big black horn is giving forth a delightful sound. A jazz band is playing and all seems lovely. The man of the house sits closely by it and glances at it nervously, while you, sewing industriously, are enjoying it immensely. The man suddenly arises from his chair to turn a little knob. Immediately a hoarse cry issues forth and the pictures on the wall quiver nervously to the accompaniment of the clinking glassware in the china closet. You cover your ears with your hands and hope it stops soon, and the man mutters, "Bum modulation, bum modulation."

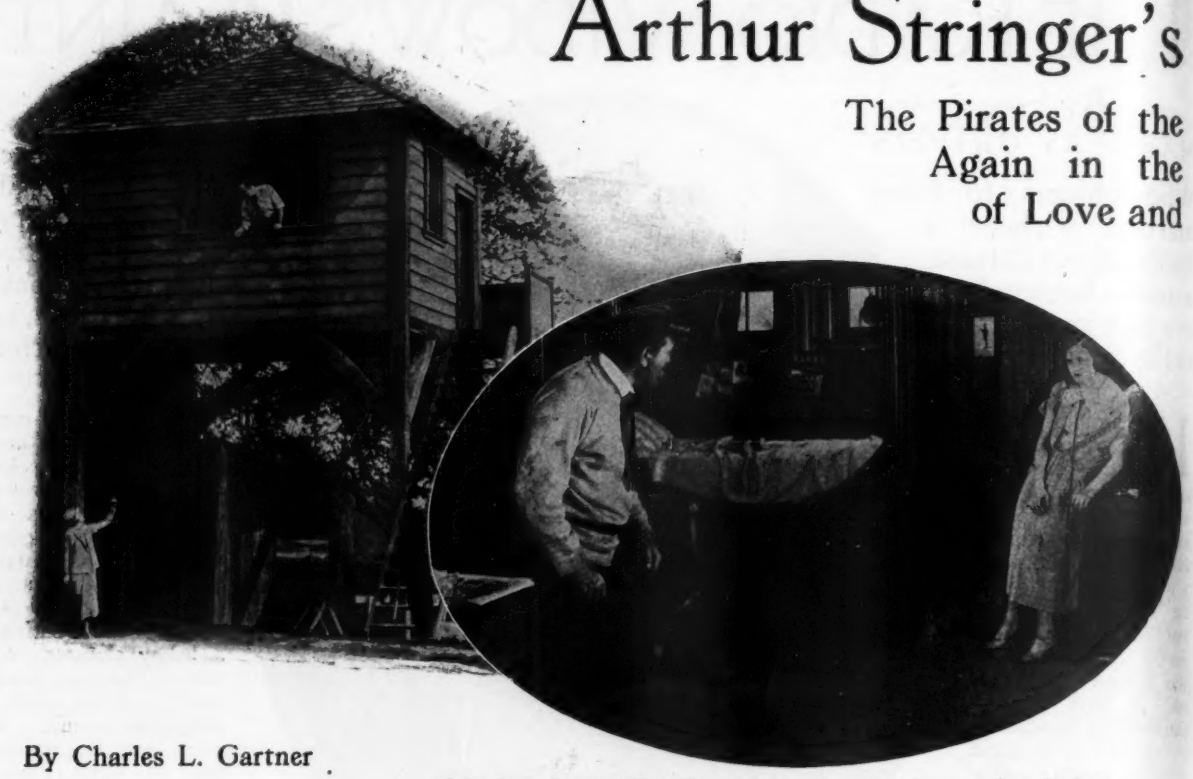
At last it is fairly quiet again. You may relax, but not for long. You wish you might hear that jazz band again, and presently amid the squalls and squeaks, you think you hear it, and you say, "John, I think that's R. S. V. P. again. Please tune in on that jazz, will you?" John is apparently stone deaf, so you try again. "John, will you—." A warning hand is raised with the command, "Sh-sh, keep quiet a minute, please, I think that was Mazatlan—." And what you think isn't ladylike.

At breakfast John will say, "That set is certainly a lulu. I just wish the Becks could hear it. Tell you what, suppose you ask them over to dinner and for the evening to hear the set. I'll bet if Bill heard it he'd buy it, then I'd build myself a six tube Iodine." With which bright specula-

(*Turn to page* 66)

Arthur Stringer's

The Pirates of the Again in the of Love and



By Charles L. Gartner

Left: Agnes Ayres and Tony Moreno at the radio tower. Above: A dramatic situation in which Agnes Ayres is discovered by Louis Wolheim

SOME time ago, when Mr. Average Citizen first rushed wildly from the living room of his home out into the street to buttonhole a perfect stranger and tell him how he got Honolulu with a two-tube set, timid motion picture theater owners all over the country raised their collective voices in a plaintive wail—for the movies were doomed! No longer could the theater owner turn his back upon the ten-year-old boy buying his own ticket—no longer could he stand outside the lobby after the last performance and listen to the pleasing comments of his patrons—no longer would romantic figures leap to life upon the magic screen—for the movies were doomed! The radio, previously considered hardly more than a plaything for the idle rich, was broadcasting the death-knell of the motion picture. For who wanted to spend hard-earned money for movies when a complete evening's entertainment was to be had amid the comforts of home for the mere turning of a few knobs and the lighting of some bulbs. The exhibitor must turn out the lights in his theater for the last time, for ours is a fast moving age, and the old toys are thrown aside for the new almost before they are soiled. With a heart-rending sigh, Mr. Theater Owner placed the day's receipts in his safe, locked the doors of the Bijou and wearily wended his way homeward.

But as the days passed and there was no appreciable decrease in the money taken in at the box office, the exhibitor began to take heart. Perhaps, after all, it was possible to be a radio bug and a movie fan at the same time. Then, after a while, when business at the theater continued in the same old way, the exhibitor forgot the radio as a competitor and proceeded to devote all his worry to the planning of his own shows. In fact, it even reached the point where the theater owner himself bought a set and now, after each performance, instead of talking over the fine points of the pictures he showed that evening, he calls Mr. Average Citizen into his office and tells him of a new hook-up he discovered.

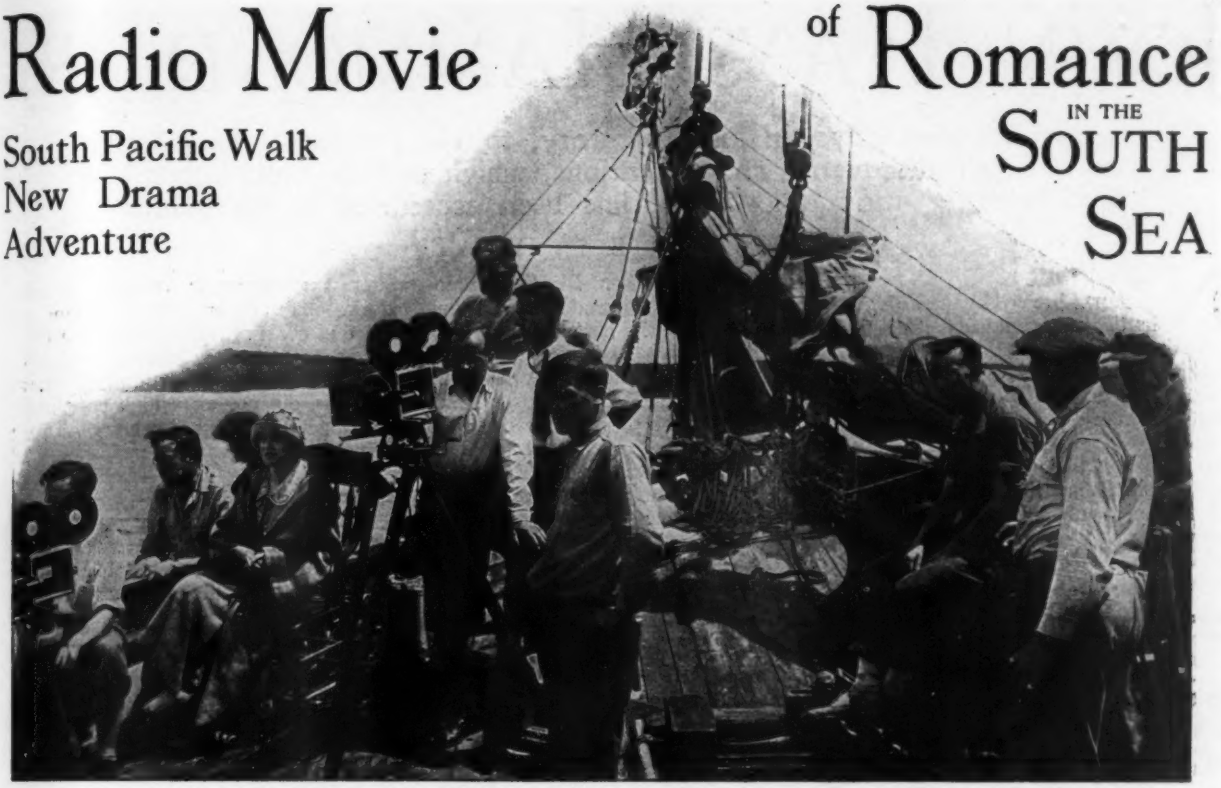
So passed the Great Movie Menace.

Today, instead of fighting the radio as a competitor, the movies use it in

A contrast in the stirring events to follow

Radio Movie of Romance IN THE SOUTH SEA

South Pacific Walk New Drama Adventure



Members of the technical staff aboard the schooner ready to "shoot" the picture

various ways as an accessory. The Capitol, Rialto and Rivoli theaters in New York City, instead of spending thousands of dollars for national advertising in magazines and newspapers, have their artists broadcast special numbers from local New York stations. Marcus Loew even has a broadcasting station of his own, which he uses to acquaint radio fans with the talent he employs. In this way, when a visitor comes into New York, he is already familiar with the type of entertainment provided by these theaters. Quite a difference in this and the original attitude of the motion picture theater owners toward the radio.

A few months ago a motion picture producer made a picture which even went so far as to boost the radio. This production, released as a Paramount Picture and directed by Irvin Willat with Agnes Ayres and Antonio Moreno in the leading rôles, was originally called, "The Story Without a Name." The story, written by Arthur Stringer, was first run serially in Photoplay Magazine. Photoplay, in connection with the story, offered $2,500 in prizes for a suitable title. Announcement was made a few weeks ago that "Without Warning" was the winning title and that the picture would be released throughout the country under this name.

A tense moment for Agnes Ayres

Following is a synopsis of "Without Warning" which should prove interesting to all readers of WIRELESS AGE:

Alan Holt, scientist and radio expert, and Don Powell, his assistant, are experimenting for the U. S. Government on a machine designed to destroy life by means of the long distance projection of electric rays. The picture opens with the first actual test of the machine being made from a specially built tower. The test is successful.

While Holt awaits the arrival of Mary, Powell prepares his low-powered radio sending and receiving set to send his daily message to his sweetheart, Ruth, daughter of a local farmer. Ruth tunes in on Powell. He tells her that Holt has successfully completed his experiments and that they are now to leave for Washington shortly. As Powell is delivering his message a cripple crosses the field near

(*Turn to page* 70)

JOHN HAYS HAMMOND, JR.

From boyhood days, in his laboratory, to the present, a long list of scientific discoveries and inventions, which include radio control and selective radio telegraphy, has been accredited to his genius

BY JEROME W. HOWE

NIGHT-TIME.

Storm-brewed by the wide Atlantic, the sea invades the rock-bound harbor of quaint old Gloucester. Raging gray billows throw their demoniacal force against a tiny craft that, in the service of science and country, is nightly venturing its dangerous course. The *Natalia*, 50-ton launch, laden with precious freight of electrical equipment and experimenters, was suddenly engulfed in one of those storms that now and then break with little warning over the eastern sea-board. Up in the bow the mechanical engineer, Trenor, was endeavoring to make the antenna secure, when, as he reached above his head, the boat was struck by a gigantic roller which broke and thrashed the deck.

Trenor was swept off his feet, and, but by a fingerhold, off the deck. The hatch luckily intercepted him and there he clung, drenched and exhausted, until a favorable moment when he could reach a less exposed quarter.

Another breaker! Snap went the tender's hawser, and away went the ship's boat.

A yell of surprise and pain! One of the little crew found himself in circuit with the power that feeds the big 60-inch searchlight. The searchlight had become grounded, and everywhere about the boat one must keep clear from any metal, for the swishing water was a ready conductor.

Then, as the boat showed its "sea-legs" and proved superior to the storm, efforts were made to recover the tender, which, when approached, would not be caught. One moment on the crest of a wave, almost overhanging the ship's deck; the next instant in a trough deep below. Finally Trenor and one of his comrades leaped and, by this speedy if hazardous method, took possession, and after buffeting the storm across the bay, both launch and tender finally arrived at their haven under the promontory of Radio Point.

The *Natalia!* She played her brave part in the development of radio.

Is it necessary to remind the reader that the *Natalia* was the boat with which John Hays Hammond, Jr. conducted his early experiments in the radio control of water-craft? That was before the War. And the *Pioneer* was before that—the old decrepit houseboat that threatened to break apart in every high sea. That was back in 1912. Along about that time we heard of the weird experiments in which this young wizard made a mechanical "dog" follow his steps under the influence of the rays of a pocket light.

OF course the precocity of this inventor gave much earlier signs than this. As a boy in Lakewood, New Jersey, he had a laboratory in which he experimented with chemicals and explosives, almost with disastrous results. While yet an undergraduate at Yale, he built an apparatus by means of which he demonstrated the feasibility of control by radiant energy. He was an ardent experimenter throughout his college course. It was soon after his graduation in 1910 from Yale Sheffield Scientific School that he commenced the notable series of experiments at Point Radio where the ample Hammond "Bungalow" with its wooded and cliff-bound estate dominates Gloucester Harbor.

He endeavored at an early period to interest government officials in his work. He demonstrated before a board of coast artillery officers in 1914, and the next year submitted a full report to Congress. Official interest, however, did not hit a high note until America entered the conflict. Then Hammond's favorite pursuit—the study of radio control—became at once a matter of supreme importance and an activity to surround with secrecy.

Military authority provided a curtain through which the public could get no hint of the progress of the young inventor's work, which went on unceasingly through long days and long nights. Army personnel was assigned to assist. Trenor and other loyal associates redoubled their efforts.

Progress came apace. From the shore a radio transmitter was effective in controlling more and more accurately the course of first one boat and then another. Mostly Hammond himself managed the transmitting apparatus, and one or more assistants were maintained on the boat to provide against any emergency or failure of radio control. On one occasion a negro was aboard, and during the course of a peaceful trip across the bay under the skillful guidance of Mr. Hammond, *deus ex machina* on shore, there suddenly rose out of the depths of the harbor, a few rods away from the boat—a submarine. The ashen-faced darky went up the mast. It was neither Prince Nemo from the pages of Jules Verne nor a crafty German death-boat come to spy upon the development of an art that threatened to match the power of the whole U-Boat fleet. It was only one of Uncle Sam's Own, come on a friendly mission. But it was rather startling just the same.

Mr. Hammond is thoroughly alive to the importance of transmission on short wave lengths, especially the use of short waves with high frequency modulations. He stated in a recently published communication to the "Evening Post" that in his belief a large bulk of future long distance traffic may be expeditiously handled in this way. And, he adds, the problem of atmospheric interference will be negligible as a result. Using this method and the new methods of photographic transmission it will be possible, he believes, to flash across the Atlantic complete pages of print, increasing the transmission speed and the bulk of business enormously.

One day the boat was sent forth upon a voyage without a human soul aboard. A perfectly good, solid, substantial boat with a phantom crew. If other craft were near, one may fancy the ejaculations and conjectures. How tales of the Flying Dutchman and other weird sea yarns would have come forth under the stimulus of such a crewless boat speeding with certainty and seamanship across the bay! For half an hour this cruise was continued, before the boat was brought skillfully to dock.

The *Natalia* was succeeded by the H-4 (the H for Hammond of course, and the numeral indicating the sequence of the boat in the series of experiments; there had been a small power-boat before the old *Pioneer*.) This was a high-speed craft of 50-foot length and she could make 25 knots. Then a seaplane was furnished by the government, and with a sending set in the plane Hammond guided his boat from the air.

To avoid the heavy weather that had so nearly wrecked the *Natalia* and had slowed up the work, Hammond took his boat to Fort Monroe during the winter of 1917-18. Indeed, Gloucester Harbor froze up and compelled the move. And at Fort Monroe the experiments continued.

To test the accuracy of control, bamboo poles with white and black discs were planted in the channel and an aviator steered the H-4 by radio control from the air. Two out of three times the boat was made to strike the pole. When it missed, it was by not more than 15 feet. At times the plane was at an altitude of 2,000 feet and a mile or two away.

All this involved complicated ar-

(*Turn to page* 74)

My Happy Radio Career

By

Eleanor Poehler

The only woman given complete charge of a broadcast station

Nor was she found lacking when radio called—and radio has called for many women

AS I look back over my life, it seems that "Me *von't!*" and "Me *vill!*" have been responsible for the various changes which have marked the epochs in development. When about three years old, my mother dressed me in a new coat and bonnet for a drive with adoring uncles and aunts. Being the first grandchild, and the first blue-eyed baby, I would have been spoiled had it not been for my young parents. Arriving at my grandparents' home for Sunday night tea, there were so many things to interest my busy mind, that once relieved of the bonnet, I pulled out of the coat and dropped it on the floor. To the command, "Eleanor, pick up your coat," I turned and said "Me *von't!*" The glint in my mother's eye should have warned me that her "Me *vill*" meant business. I lower the curtain over the "business." Suffice it to say, I picked up the coat, threw it on the bed, and ignored my mother for the rest of the evening.

A year and a half later, I remember very distinctly standing in the rain gutter which ran around the dormer windows of the three-story house, waving my hand to the terrified people in the street below, while my mother and grandmother worked with a refractory window in back of me, talking quietly to hold my interest until they could open it enough to clutch me before I should fall. I made a complete circuit of the house twice before the window was nailed down so that I could not get out.

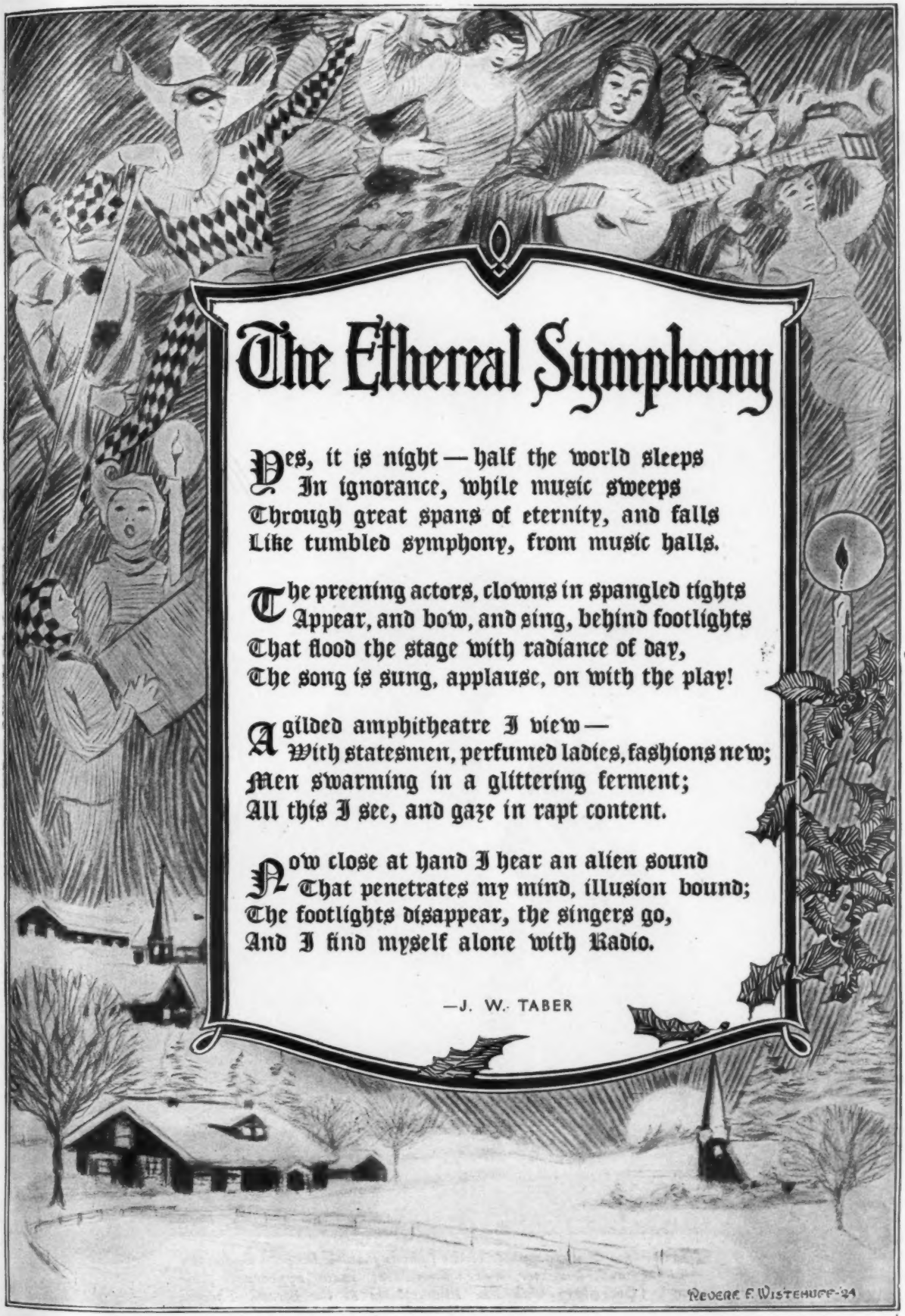
As I look back, I seemed to try everything. I loved color, I certainly loved rhythm, and I seemed to have no special bent until I was nearly eleven or twelve years of age, when my teachers thought enough of my artistic talent to request my mother to have me major in English and Art, combining authorship and illustrating. About this time, I was invited to take part in an opera, "Snow White," and was given the part of the wicked queen. At the idea of my singing, the whole family was vastly amused. It had never dawned upon them that possibly I had a "golden throat." The amused consent of my mother must have aroused the "Me *vill*" spirit in me, for I went through with the opera. I formed a very sincere friendship with Louis Weitzel, now a prominent musician in Richmond, Virginia. Louis was Carl the Huntsman. He was full of music from top to toe, and had had training under the eminent George Normington. He felt that I had a voice, so he carefully trained me after school or in the early evening, until after a few months, I really did begin to sing. Then all thoughts of literature and art beyond amusing myself with them, left. I was determined to sing.

I had always had an intermittent thirst for all kinds of knowledge. I can honestly say that practically everything but mathematics and a taste for oysters interests me. Those two things I am perfectly willing—nay, delighted—to leave to experts. I had visions, as most girls do, of a career in concert and oratorio work. Deep rooted in me must have been a balance wheel. I never felt that I could make opera, so did not try.

These aspirations were soaring romantically when real romance stepped in, and I met Dr. Frederick C. Poehler, whom I married one year after leaving high school. His death and the birth of our son, Frederick, Jr., a year after our marriage, left me without much ambition, and without much desire. It was due only to the devotion and encouragement of my mother and step-father and one or two friends, that I crawled back to a healthy interest in anything. Then it was not so much a desire for a career, but a need for something to do, and so, following the line of least resistance, I took up the serious, definite study of singing, with its auxiliary branches. From then on, I went steadily forward, poking my nose into everything that interested me.

I was firmly established as a teacher and had quite some reputation as a "diseuse." I seem to have had a gift as a choir and glee club director. I was

(*Turn to page* 80)



The Ethereal Symphony

Yes, it is night — half the world sleeps
In ignorance, while music sweeps
Through great spans of eternity, and falls
Like tumbled symphony, from music halls.

The preening actors, clowns in spangled tights
Appear, and bow, and sing, behind footlights
That flood the stage with radiance of day,
The song is sung, applause, on with the play!

A gilded amphitheatre I view —
With statesmen, perfumed ladies, fashions new;
Men swarming in a glittering ferment;
All this I see, and gaze in rapt content.

Now close at hand I hear an alien sound
That penetrates my mind, illusion bound;
The footlights disappear, the singers go,
And I find myself alone with Radio.

—J. W. TABER

Dagmar Godowsky, daughter of the famous pianist, Leopold Godowsky —father and daughter make their first radio appearance this month (December) with The Plunketteers at the Strand Theatre

the PLUNKETTEERS OF THE AIR

By Golda M. Goldman

Above: Carl Edouarde
Center: Estelle Carey
Left: Joseph C. Plunkett

Personalities you'll want to know better this season

—And a Word About Their Programs

WHEN Joseph C. Plunkett sits before the microphone in the studio at the top of the Mark Strand Theater and announces the program of the "Plunketteers," he is broadcasting the biggest tie-up which has ever been effected for anything outside of important presidential speeches and the like. For these "Plunketteers," be it understood, are enterprising people. They are not satisfied with a simple announcement, such as "Broadcasting through Station WEAF, New York City" or "Station WOO, Philadelphia," but since they link seven stations every Wednesday evening that they "take the air," they must add Stations WEEI, Boston; WMAF, South Dartmouth, and stations in Cleveland, Chicago and Pittsburgh.

Three men are responsible for this remarkable movement by which every crystal set in the eastern part of the United States may tune-in on the Strand Theater. First of all, there is Colonel E. H. Green, son of the late Hetty Green, who is the wealthiest radio enthusiast in the country. It is his ambition to have the finest radio broadcasting station in the country, and for that reason, he has built Station WMAF at South Dartmouth, Massachusetts, where he experiments widely in both radio telephony and radio photography. But since it would be difficult to take the broadcasters all the way to Buzzard's Bay, he has arranged with the management of the Mark Strand Theater to do his programs for him and so they are carried by wire from the Strand studio to South Dartmouth and the six other stations, so that all the world may listen-in.

Do not think, however, that Colonel Green selected his concert manager and orchestra leader at random. He knew very much what he was doing. Joseph C. Plunkett has for five years been managing director of the Mark Strand Theater. His is the master mind which surrounds each motion picture with a suitable harmony of color, light and prologue. He has, as his assistant, Carl Edouarde, leader of the Strand orchestra. Mr. Edouarde is an outstanding figure, both physically, because of his splendid physique and noble head, as well as musically, for the fact that when his orchestra opened the Strand Theater, ten years ago, he was the first man to dare play anything but tin-pan melodies in a motion-picture theater. He said, at the time, that he would either make Broadway like his music or he would get off Broadway. The answer is that the Strand orchestra has grown from eight to fifty men.

This is not by accident, you understand, but because he has made a study of the psychology of crowds and has carefully learned the needs and tastes of his audiences, deliberately developing that taste by a slow growth from the simpler popular melodies from "William Tell," etc., to things such as the "Rumanian Poem" by Enesco, and "Les Prelude" by Liszt.

The "Plunkett-Edouarde" combination has resulted in their being asked to do special prologues and scores for the

(*Turn to page 78.*)

The DX Go-Getter

Tuned R.F. Inductively Coupled to Antenna Coil, a Regenerative Detector With Audio Amplifier Which Will Loudspeaker Anything Heard on Phones—Excellent Quality and a Real DX Receiver

By R. A. BRADLEY

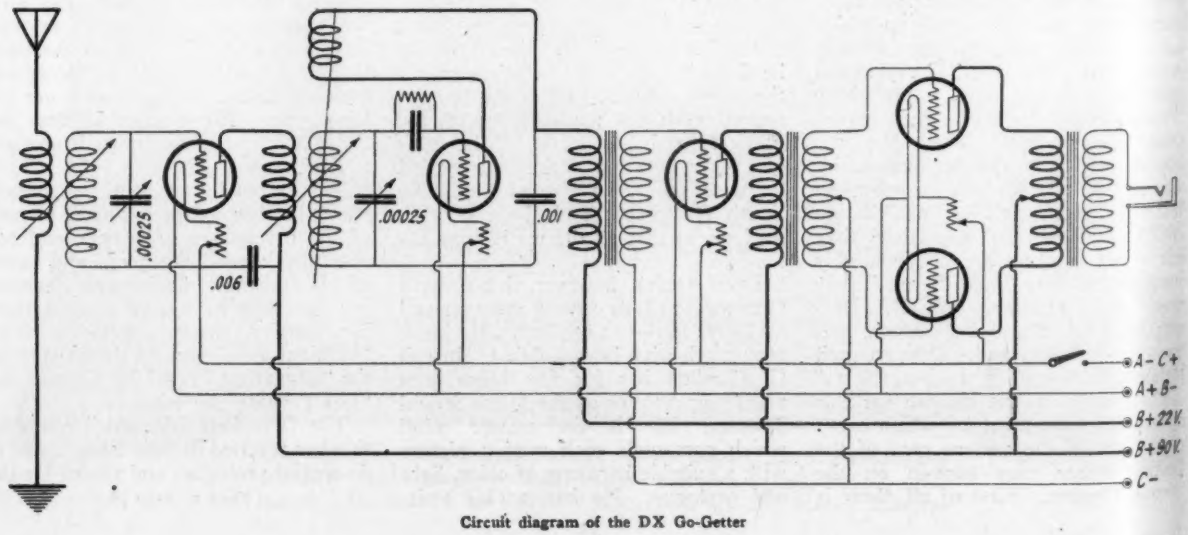
THE use of tunnel radio frequency amplification ahead of and in conjunction with a sensitive regenerative detector has appealed to many as being an excellent combination. It is generally conceded that a regenerative receiver operated by one who knows his set, can equal in DX reception a non-regenerative receiver with two stages of untuned radio frequency amplification. The success of tuned radio frequency in the various forms which are found on the market including capacity neutralized, resistance neutralized and bias control by a potentiometer, is, of course, a testimonial to its sensitiveness. Regeneration, since its discovery, has been deservedly popular, because of its ability to bring in the distant stations. Regenerative sets in the past have been rather difficult to master. Of course, even a dub could probably get something on a well designed regenerative receiver, but to get to know your receiver meant months of experience with a particular one. Within the last year, the regenerative receiver with a tickler coil feedback has been immensely improved and likewise simplified by the use of an untuned primary or antenna coil. This one thing cut the number of tuning controls from six to two, namely, the wavelength dial and the feedback dial. Immediately this simplified receiver jumped into great popularity and justly so too. The Ambassador, the Air King, the Transcontinental, the Shepco and the new Bremer-Tully are some of the well known types of this unit, consisting of a secondary coil tuned by a shunt variable condenser, a primary coil—with few enough turns of wire to keep the fundamental wave of the antenna circuit below the minimum wavelength to which the secondary or grid circuit can be tuned—closely coupled to the secondary coil and a rotatable tickler coil.

We have so far two sensitive components, the tuned radio frequency and the regenerative detector. Now, if we combine these two, ought we not have a DX go-getter? Well just watch the result.

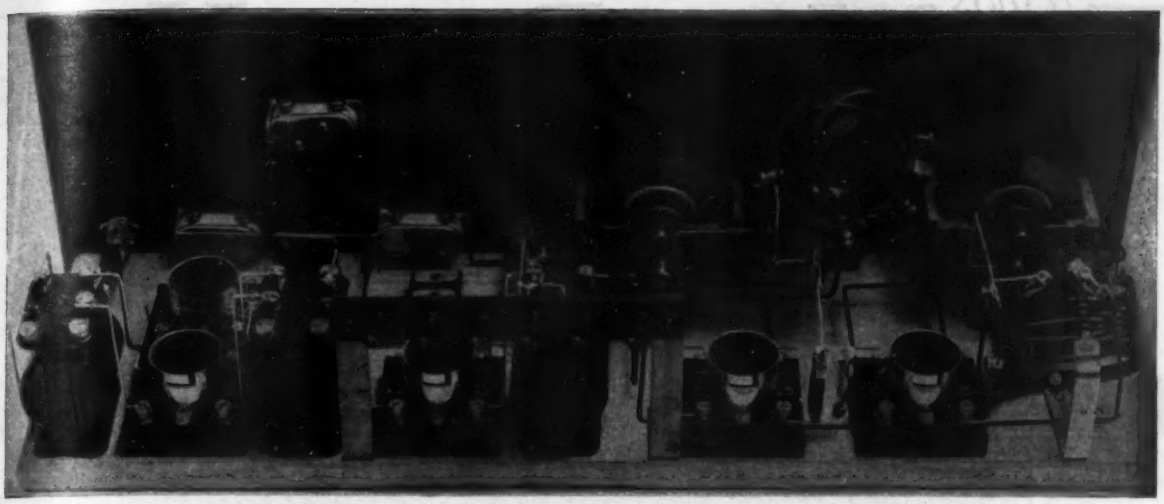
Understand we are by no means claiming originality in the circuit, nor in combining the two in this fashion. We do, however, claim that this receiver, as a DX receiver, is a go-getter, and that it is one of the most selective receivers that can be built consistent with no loss in signal strength.

As an example of its superior selectivity, it was impossible to tune even local stations without a good vernier. As the receiver now stands, it is equipped with excellent verniers and full advantage of their micrometer qualities is realized.

The receiver centers around the two coils and two variable condensers. The success of the receiver is due entirely to these factors and we unhesitatingly recommend them. The antenna transformer consists of a number of turns of wire wound around a bakelite tubing. Great sections of this have been cut out of the winding form so that the dielectric losses are extremely low and all that is left is a strong framework. Long and loud have we preached on good coils and good condensers. We have a creed "A good coil and a good condenser make one good set." And here we have it—tuned radio frequency amplification inductively coupled to the antenna coil—



Circuit diagram of the DX Go-Getter



The radio frequency transformer and the detector tuner are mounted so that the planes of their windings are at right angles

which is untuned—and a regenerative detector with an audio amplifier behind it which will "loudspeaker" anything which can be heard on the detector with a sensitive pair of phones, with quality above the average. It is not an economical receiver, but it is thoroughly dependable and we reiterate —a real DX receiver.

A few points on generalities now before we go into its construction. The Bremer-Tully antenna transformer and detector tuner with its 180 degree tickler—both low loss—are designed so that the antenna coil and the radio frequency plate coupling coil may be moved on an adjustable arm and the coupling varied until the correct setting is had which is then fixed by a thumb screw. This is a tremendous advantage as loose coupling between the pickup coil in the plate circuit of the radio frequency tube and the grid coil of the detector is absolutely necessary. The trouble with the combination of radio frequency and regeneration in the past has been the disastrous feedback occurring between the plate circuit of the radio frequency tube and the tickler coil of the detector. The loose coupling obtainable with this new unit does the trick. The coupling may also be varied between the antenna coil and the radio frequency coil for greater selectivity.

Another point in the receiver is the use of the .0005 mfd. variable condensers. The two tuning units are designed to cover the broadcast wave band, when tuned with .00025 mfd. condensers. We wanted to use this set on 600 meters as well as for broadcasting, so the substitution was made. We recommend that you use .00025 mfd. (11 plate) variable condensers of good low loss design in conjunction with a good vernier dial. This set tunes so sharply that every bit of the advantage of a micrometer adjustment is made use of. To bear this out we give here some of the readings obtained. Incidentally, the dial reading can be depended upon to be accurate to one-half degree providing the transmitted wave of the station is fairly constant.

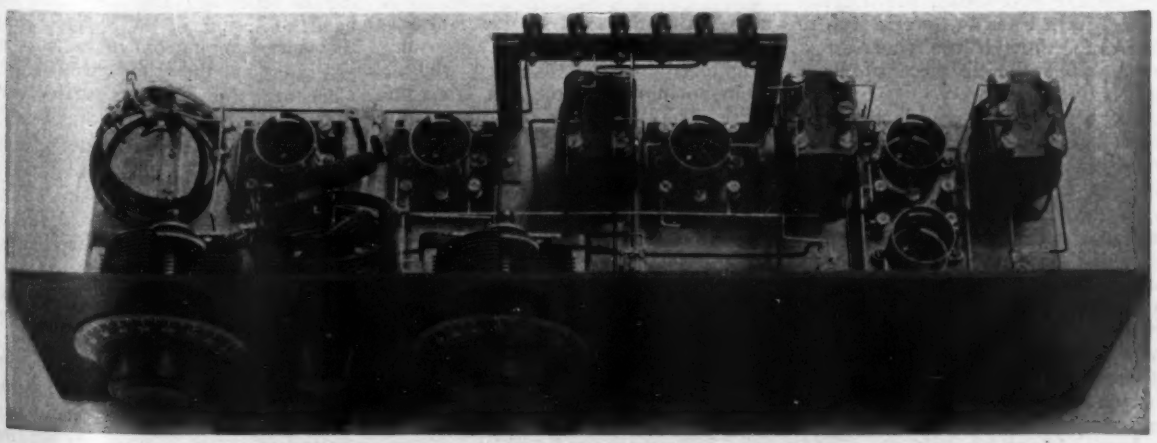
(*Turn to page* 91)

THE DX RECEIVER

Bremer Tully tuned radio frequency transformer
Bremer Tully regenerative low loss tuner
One Carter filament switch
Two Carter single closed circuit jacks
Five Howard sockets
Four Bradleystats
Dubilier Micadons .00025, .006, and .001 mfds.
One 3-megohm Durham fixed metallic grid leak
One Samson six-to-one audio frequency transformer
One pair Samson push-pull transformers
Six Eby binding posts
Two American Brand .0005 mfd. variable condensers
One 7"x24" Mahoganite panel
10 lengths Acme Celatsite wire

ACCESSORIES

One 6-volt 100-amp. hr. storage battery
Two 45-volt B-batteries
Five UV-201 A's
One pair of phones
One loudspeaker



Loose coupling between the plate coil of the r. f. tube and the grid coil of the detector tube is the secret of the stability of this DX receiver

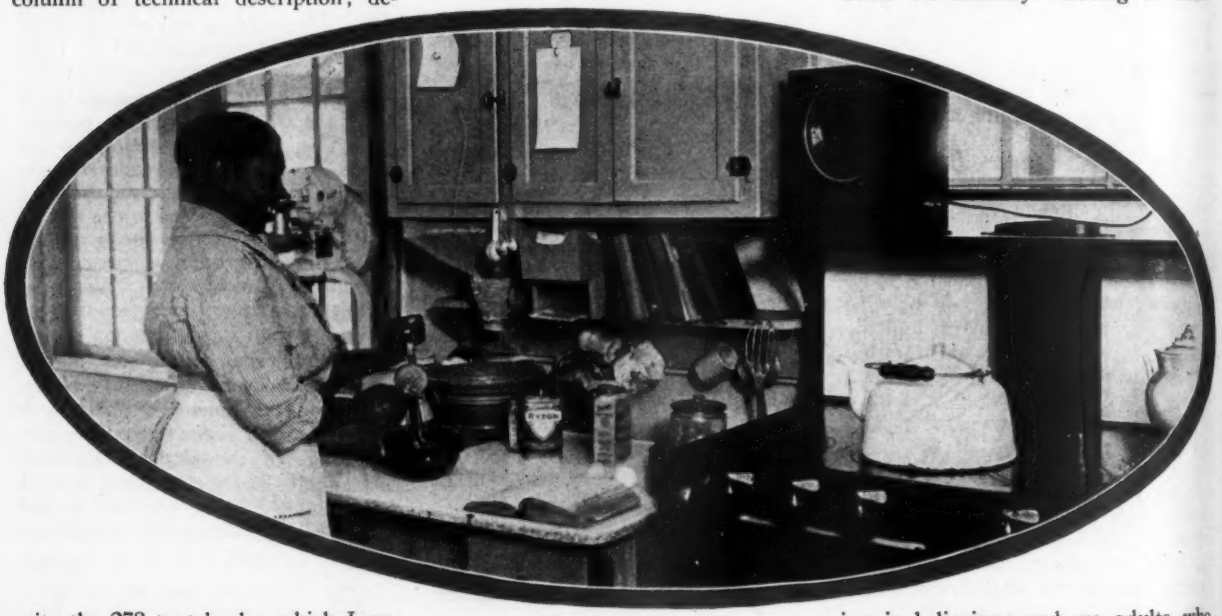
it was The Night Before Xmas that I Realized the Sheer Magic of Radio

By MRS. CHRISTINE FREDERICK

TO me, radio has a kinship with Christmas.

At first I felt rather than understood it, but I realize now what it is. The myth and mysticism of Christmas and the Santa Claus legend have this much in common with radio—they make magic and cheer from something which is only dimly understood.

Radio, despite the column upon column of technical description; despite the 278 text books, which I understand have been written, is still, to the average mind, little short of a miracle; an authentic piece of sheer magic.



And the curious thing is that one doesn't lose this sense of magic after several years of familiarity with radio. This fact came over me in a rather peculiar way a Christmas eve or two ago. We had labored all Christmas eve, until the midnight hour, decorating the tree, and then had rested for ten minutes before retiring. Out of curiosity, I suppose, my husband had tuned in the radio set, but had come upstairs, leaving the switch on. Only by chance did I come on the landing upstairs and hear sounds from the speaker and realized that the switch had not been thrown.

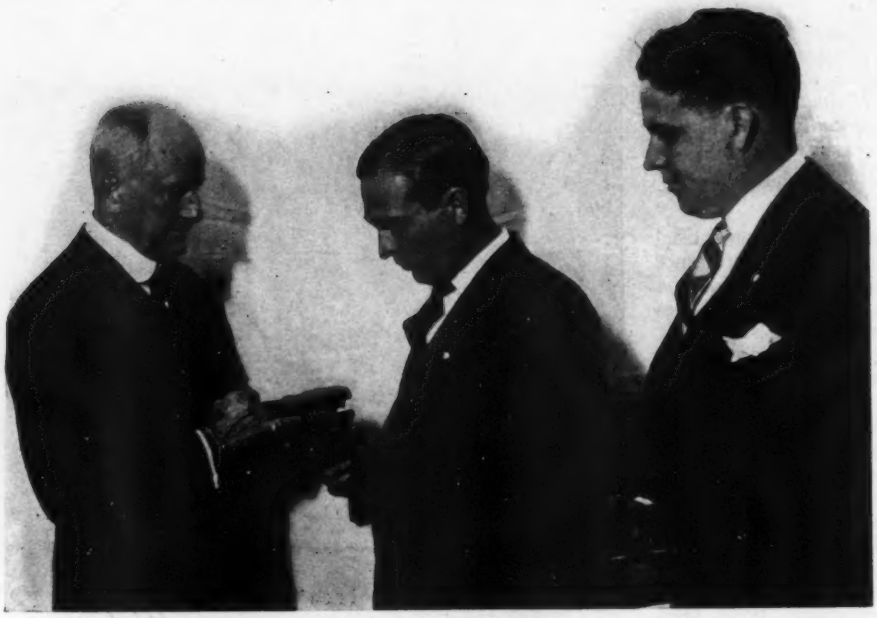
So, in a kimono, in the dead of Christmas night, I descended the stairs in the dark. There was a moon and a snowfall, and from the big bay window came an eerie, reflected snow-light, which made the newly decorated Christmas tree glitter in all its yet undiscovered glory.

And there, in the middle of the room, was the faint glow of the radio bulbs, with the loud-speaker emitting indistinct sounds, which, to my heightened imagination, were sounds from no human source, but from the Wise Men of the East, or from Joseph and Mary, or from Santa Claus. It was a "spooky" experience, but a perfectly logical impression and feeling, under the circumstances. It fixed in my mind a certain attitude to radio, which, call it womanish superstition, if you like, nevertheless probably reaches down to that mystical self, which even the most irreligious of us sometimes discover in ourselves.

Children, who are closer to myth and magic, feel it very definitely. The wonderful things which "come out of the air" are decidedly akin to Santa Claus, who emerges out of the far North over house-tops, riding also on the air, in a reindeer sleigh, and comes down into the house through the chimney. To the child-self, and to a certain primitive part of adult-self, the Santa Claus myth is no more magical, if not less, than radio. We adults accept it, quite in the same faith in a concrete proved reality, as does the child, who is told Santa Claus came down the chimney. Seeing or hearing is believing; and we adults who have no technical knowledge, accept the voices coming out of radio as uncritically as the child who sees a Christmas tree and toys arrived overnight, believes that Santa was here.

In this day, of so many scientific wonders in many fields, this attitude of faith in magic is a necessity. What the lack of it does is shown in the attitude of one of my old neighbors in our house in the country. Several years ago, when radio was less well known, he "listened-in" to our set, and then grinned. "Them kids of yours is smart, but they can't fool old pappy. They're down in the cellar—or somewheres, talking this inter one of them there telephones. 'Out of the air from

(*Turn to page 87*)



Left to right: General James G. Harbord, President of the Radio Corporation of America, presenting the medals to Senior Operator Elmer H. Walter and Junior Operator C. E. Sullivan, Jr.

R C A Decorates Radio Heroes

General Harbord Presents the Radio Corporation of America Medal to the Operators of the *Boston*

MAJOR GEN. JAMES G. HARBORD, President of the Radio Corporation of America, has presented the bronze medal of the organization and a check for a substantial amount to Senior Operator Elmer H. Walter and Junior Operator C. E. Sullivan, Jr., for their meritorious services on the night of July 21, 1924, when the steamboat *Boston* was rammed by the oil tanker *Swift Arrow*.

The presentation was made in General Harbord's office in the Woolworth Building, and was in the presence of several officials of the Radio Corporation of America among whom was included Mr. G. Harold Porter, General Marine Superintendent of the company. The medal can be worn as a decoration or as a lapel button, and has the "S O S" signal on one side.

When the *Boston* was rammed by the tank steamer *Swift Arrow* in a dense fog off Point Judith twenty minutes before the midnight hour, Elmer Walter was on watch. Within a few minutes Sullivan was with him.

The lights went out on the steamer twenty minutes after the collision, but the wireless operators remained calmly at their post in the darkness, sending out messages to nearby vessels, which came to the rescue.

Walter sent out the distress call and the subsequent messages. With Sullivan out on deck listening for the whistles and Walter directing the movements by radio, the *Priscilla* was able to pick up the passengers, a coast guard cutter to come alongside to take off the dead and the *Commonwealth* with naval vessels to make lines fast and tow the *Boston* into Newport.

RADIO CORPORATION
OF AMERICA
[illegible] BROADWAY
NEW YORK

EXTRACT FROM MINUTES OF MEETING OF THE BOARD OF DIRECTORS

RADIO CORPORATION OF AMERICA

HELD AUGUST 15TH, 1924

"After discussion, on motion, duly made, seconded and unanimously carried, it was

"RESOLVED, that the Radio Corporation of America Medal be and hereby is awarded to Elmer Hall Walter and Charles Eugene Sullivan, Jr., Radio Operators on the S. S. "BOSTON", for meritorious service performed by them at the time of the collision of the S. S. "BOSTON" with the S. S. "SWIFT ARROW" on the night of July 21st, 1924, and

"FURTHER RESOLVED, that an honorarium of $100. be given to Elmer Hall Walter and Charles Eugene Sullivan, Jr., at the time of the presentation of the medal and

"FURTHER RESOLVED, that a copy of this resolution, duly signed by the proper officers of the company, be presented to Elmer Hall Walter and Charles Eugene Sullivan, Jr."

J. G. Harbord
President

Secretary

"The problem of super-broadcasting, like any other department of progress, will be settled upon the principle of public service. Ultimately, performance—not opinion—will determine the direction of progress in the radio art." —David Sarnoff.

Su

By
O. C. ROOS
Fellow I. R. E.
Member of Continuing Committee — Hoover's Third Radio Conference

OF all outstanding questions raised by the third Radio Conference in Washington, D. C., the public has seized on the possibilities of super-power broadcasting stations of more than 1,000 watts. A storm of protest has been inspired by appeals from owners of small stations, who fear they may be "blanketed." Moreover, politically minded publicists have taken up the proposal as a sinister indication of possible future "monopoly" and radio censorship.

The irony of the situation consists in the fact that those who have most strenuously argued against payment for broadcast programs have been labeled "the Four Horsemen of Radio" by demagogues, who have been averse to permit even experimental licenses for large scale tests on stations of 5,000 to 50,000 watts as a tentative upper limit.

There are so many technical, ethical and social factors complicating the present situation in the broadcasting field, that it is safe to say that a satisfactory solution of them all by the Third Radio Conference would be an impossibility. This applies to the mere question of wave channels for the five hundred odd broadcasting stations of 1,000 watts or less.

There is no question of super-power here but one of interference between stations in the same or adjacent zones.

A study of the relation between the wavelengths in the broadcasting band and the apparatus on the market shows that some time must elapse before stock sets generally—can be made to tune down to 200 meters efficiently.

Again, it is practically impossible to keep all the stations in a given zone at 50 k.c. apart in frequency, or to keep stations 20 k.c. apart from those in adjacent zones, without "dividing time." There are not "wave channels" enough to go around among five hundred and nineteen broadcasting studios.

As soon as the problem of dividing time is taken up, the stations spending $100,000 or more annually on broadcasting will demand exemption, as they can not profitably operate on divided time.

Such stations prepare programs for months in advance, and it is a generally recognized tendency for higher powered studios to give more systematic changes in programs to satisfy a more widely scattered audience than can be done by smaller stations. It is a fact that WLW Cincinnati, Ohio, is planning its professional concerts for a year in advance. This has been brought about by nothing else than the completion of plans for a 5,000-watt station. Other stations will naturally follow this practice, as competition for talent increases.

Let us next examine the present situation in its relation to the future effect of the "super" or giant stations.

If we ask ourselves what the effect of unchecked multiplication of the present types of stations will mean the answer from an engineering and administrative standpoint is simple. It spells chaos!

This is no exaggeration, and I want to hammer it home. We must either change our broadcasting bands, divide time, or else reduce the number of stations!

International regulations prevent the first, at least, for another radio season. "Divided time" may cause legislative action, which is contrary to the spirit of co-operation, so far successful in reducing antagonism between different mercantile radio groups. So we are apparently driven to the conclusion that pure "regulation" —without legislation and the attendant evils of "bloc lobbying"—can only be applied successfully and with general good will, when the American public is served with adequate entertainment and instruction by fewer rather than by more stations. It is my personal belief that three hundred stations can and will in the future be amply sufficient to cover the U. S.

I seem to hear immediately a chorus of protests, "Who is to choose?" "Nobody but yourselves—the public." Economic laws of supply and demand helped out by the sinister drag of "overhead" will do the rest.

"What has super-power to offer in ameliorating this conflict of wavelengths?" you may ask. It will inevitably tend to reduce interest in purely local stations to purely local items. Local celebrities will have their due, but the highly paid talent of a chain of super-stations will be in a class very seldom reached even today. It will be listened for everywhere.

To indicate what program refinements are possible and necessary, let me state that many orchestras and bands, espe-

"Thousands of owners of moderate priced radio receiving sets in the United States will be the direct beneficiaries of a better system of broadcast transmission."—Powel Crosley, Jr.

Illustration at left—President Coolidge addressing Secretary Hoover's Third Radio Conference

Super-Power

The future of broadcasting discussed in the light of present day conditions—Views by Sarnoff, Mc Donald and Crosley—Statement from the Department of Commerce

cially the latter, are today allowed to broadcast with poorly "matched choirs" of wood-wind or brass. I speak from thirty years of musical experience, in chamber and orchestral amateur work, having been a director of the club which formed the Manila Symphony Orchestra. The tone of this orchestra was superb. The brass choir had all its instruments matched in timbre, likewise wood-wind, etc. The Filipino has a keen musical ear and this is equally true of the Latin.

Most Spanish bands sound like a beautiful soft organ, and no band ever excelled in beauty of tone the Filipino Constabulary band. However, alas! we do not apparently pay any attention to such things in our present radio studios; it is only the advent of super-stations, with highly trained musical supervisors, that will compel a higher standard in local stations.

Again, it is not generally realized that broadcasting requires as much careful experimenting with the positions of the performers as phonograph recording does. Anyone who has seen instrumentalists perched on a group of ladders near a recording device in such a laboratory will recognize how necessary this is for "100 per cent." broadcasting. It can be done and it must be done in the future. The public will be educated up to it within another year and will demand it.

We now approach the arena of our big questions: "Why does anybody want super-power? What will it do to congested districts? What do we actually know about it?"

The first of these questions is scarcely answerable from the business point of view. There are too many conflicting interests. Telephone utilities, which are not direct broadcasters, are desirous of linking up high power stations. President Coolidge is really using super-power when a score of stations are tied together to hear his voice.

The particular difference between this kind of super-power and that given by one or two 50 k.w. stations doing the same thing is that there is a greater factor of safety or rather security of service from a larger number of stations all going simultaneously. However, it is not an economical solution to tie up millions of dollars of equipment when the same results can be achieved by several other methods.

Hence we come to the technical reason why some firms want super-power. The Westinghouse Station KDKA is undoubtedly the most popular all-year station we have today. It sends out from the heart of East Pittsburgh as much as 8 k.w. of energy at times on short waves below 100 meters. It sends out the same broadcasts on 326 meters and holds its frequency within 1-10 per cent. There is no especial interference reported and the short waves are heard in South America clearly.

We are in a technical safe harbor here, as far as high power goes. The public should be educated to realize that almost any amount of power can be safely broadcast at these short waves without interfering with amateurs or broadcasters. Simple calculations show that by replacing the interconnecting telephone lines for nation-wide radio events—by four or five high power short wave relay stations—a single voice can reach every home in America with about 1 per cent. of the cost to give the same result by wire connections. This would mean twenty-four million homes supplied by a central 100 k. w. station at 60 meters and four stations relaying or "boosting" this broadcast, each of perhaps 20 k.w. at 90 meters.

Local relay stations would use their own zone waves between 200 and 546 meters.

The above picture is not exaggerated and seems to promise less interference than any other general program distributing system which will be capable of reaching the whole American public within two years. It is true that General Squier can put line radio into use over 140-mile power lines to supply three programs at once, but the system is not in the merchandising stage as yet. It is to be capable of co-operation with either radio relay systems, or it can furnish very high grade programs to the true super-power station.

By "true super-power" is meant 5 k.w. or more at the usual broadcasting wavelengths, 222, 546 meters, or even higher. Waves of 1,200 meters and more are very successfully used in Europe, but static and fading increase, in general, when the longer waves are used for broadcasting.

The static "background," which is always present, along with the listeners' background of radio noises, makes it impossible to distinguish radio sounds below a certain intensity. If

we can keep our received sounds above this, say in the heart of a city, we are at liberty to gradually move our transmitters away from the city, while increasing their power so as to keep the signals clear.

Here we have our real technical answer to the question: "Why does anybody want super-power?" Namely, "To overcome static and interference, to give a wider area of service, and to reduce the difference between day and night service."

It is a technical fact that in the districts close to a high-power station the signals do not go up in proportion to the power, but the distant listener *does* gain in reception proportionately.

It is certain that interference from a Class B station becomes negligible at a distance from the average receiver of about two miles. This interference diminishes inversely as the distance of the transmitting station, with a given number of "meter amperes." This quantity is found by multiplying the effective height of a broadcasting vertical, say 20 to 70 meters, by its effective current at the base. In trans-Atlantic code work, it rises to 80,000 and more. In broadcasting, it is usually below 1,000.

The advocates of super-power are going to raise this figure to 10,000 or even 20,000 meter amperes. This will mean a day-and-night effective service through all usual static of 500 or 1,000 miles radius, depending on the season. The trouble now is that the public does not realize that the usual Class B station cannot give a guaranteed service of more than 10 to 20 per cent. of this. I mean by this a service which will enable ordinary static to be ignored. It is a hard thing to say that a 500-watt station is only really reliable for twenty-five to fifty miles for all-year service, but such is the engineering status of the situation.

The second question about congested districts is met by the fact that most listeners are in the apartment and suburban sections of our great cities. Stations like WJZ do not blanket out good receivers. Moreover, simple crystal sets will come back into more extensive use in the cities with the advent of super-power. There is no better quality of reception possible, as our German radio friends are indicating by their purchases.

Those who want distant stations besides those of the super-power, must use tuned multi-stage apparatus with "lossers," stabilizers or the "super-het" principle.

All this means in plain English that there is nothing to get hysterical about. The fact that a prominent New York City station "gummed up" the air, was due to the experimental character of the apparatus used in an attempt to control the antenna power by hitherto untried methods.

The applicants for these super-power licenses are under strict governmental control and can only start their experiments at moderately increased powers. No one is going to immediately radiate 10 k.w. from the heart of a large city.

O. C. ROOS
Delegate and Member of Continuing Committee at Sec. Hoover's Third Radio Conference

The Crosley Corporation will go out perhaps thirty miles from Cincinnati for a site, and we have no right to assume they, as well as the Westinghouse and General Electric Companies, cannot solve the problem of non-interference. Even if this becomes difficult on the present broadcasting wavebands, there are the short waves successfully used by KDKA, KFKX, CKAC and WGY with from 1,000 to 12,000 watts in the vertical.

The above four stations give us valuable data on "What do we know about it?" our third question.

True, there has been interference of 50 k.c. away from WGY in New England, but the transmission is undoubted "freak" transmission thereabouts, as is plainly indicated by the terrific fading from this powerful station.

If future stations are equipped with "harmonic suppressors" like the very efficient Edison station WEEI at Boston, Mass., some of these fading phenomena may become things of the past, and the familiar but misleading change in "quality" of sound as we go away a few hundred miles from a station over uneven ground, heavily "loaded" with shore lines, rivers and forests—not to mention a cluster of absorbing receivers—will disappear.

The controversies existent before the advent of the new CKAC super-power station, to the effect that such power would wipe out everything else within a radius of one hundred miles, have fallen through. So sharp is the tuning of this station, that local listeners report distant stations are easily brought in, while CKAC is transmitting. The signals, however, are received locally, with approximately three times the former intensity.

DAVID SARNOFF'S VIEWS ON SUPER-POWER

OUT of the mists of opinion that becloud the progress of the radio art one fact stands out in clear perspective. The march of progress must lead to the same destination, and its final objective must be the home.

Yet the problem of what constitutes progress in radio too often is discussed from the standpoint only of reception, or only of transmission. The best receiver in the world cannot make the signal emanating from a weak broadcasting station clear and satisfactory, while the most inexpensive receiver in the home is made immeasurably more effective by a good signal from a more powerful transmitting station. Thus progress in radio necessarily means progress both in broadcast transmission and broadcast reception.

Nor need the problem of interference stand in the way of better broadcasting, for the Third National Radio Conference has wisely recommended that high-power broadcasting stations shall be located outside and at some distance from populous centers. The effect of location can best be illustrated by this fact: The broadcast station of the present 1 k.w. type located within the city emits a signal more powerful in its neighborhood than a signal received in the same neighborhood from a station fifty times as powerful, located twenty-five to fifty miles from that city.

If good signals are clearly heard in the winter, the transmitting station should similarly produce an acceptable signal in summer. Daytime service and night service should be acceptable even for considerable distances from the broadcasting station. In order that this may be achieved, sufficient power has to be provided at the transmitting station to meet the more difficult conditions of daytime summer reception as well as the comparatively easy conditions of night time winter reception. Higher power broadcasting provides the ready means of doing just this, and introduces into broadcasting a hitherto unobtainable degree of stability and all-year-round smoothness of reception.

By doing this, super-broadcasting will carry the best of the programs originating in the great cities of the United States into practically every

home, winter and summer, and day and night. Once a reasonable number of super-broadcasting stations are in successful operation, every listener will get reliable service at any time from one or more of them, and most listeners will have a considerable degree of latitude in choosing the program to which they will listen.

At the same time, the economic basis for high-grade broadcasting will be very firmly established by the super-broadcasting station. It is clear from even a brief analysis of the situation that nationally interesting programs can be sent out economically only from stations of such power that they reach vast bodies of listeners. Many of the smaller stations are obviously better fitted to carry out the useful, but different function of catering to special local groups and to sectional tastes. The super-broadcasting station is, however, a much more expensive project to establish. Reaching as it will, large groups of listeners, it will be able to select the best program available.

Powel Crosley, Jr., President Crosley Radio Corporation

I regard super-broadcasting as a stimulating form of competition to other systems of national broadcasting. In providing an effective substitute for wire line networks connecting a multitude of low-power stations, it acts as an alternative and additional method of providing entertainment and instruction to the people at large. I hope that wire line networks and radio relay systems for interconnections of broadcasting stations will be fully developed side by side with super-broadcasting, for I think that such parallel lines of development will react favorably on each other and insure the speedy production of equipment and methods for general use embodying the best of these systems or possibly continuing all of them.

The provision of programs for the super-broadcasting station of the future is also going to be a competitive matter. Individual super-power stations will compete with each other for pre-eminence and favor in the air. Program agencies will no doubt be prepared to furnish specially trained talent to the radio broadcasters, and these agencies will, like the various press associations, give the public those advantages which spring from healthy rivalry. Freedom of the air can be maintained under such conditions, where, at least three fundamental methods of transmission (i. e., (1) local, (2) interconnected, and (3) super-power stations) compete with each in furnishing nation-wide broadcasting and numerous program-producing groups similarly attempt to secure the favor of the public and of the broadcasters.

David Sarnoff, Vice-president and General Manager Radio Corporation of America

The problem of super-broadcasting, like any other department of progress, will be settled upon the principle of public service. Ultimately, performance, not opinion, will determine the direction of progress in the radio art.

Speaking for the Radio Corporation of America, I can say that we are ready and willing to demonstrate the measure of service that super-broadcasting can render by erecting an experimental station, suitably located, that will prove the promise which super-broadcasting holds out to the public.

STATEMENT FROM THE DEPARTMENT OF COMMERCE

The Third National Radio Conference, at the Department of Commerce, recommended that a general increase in power over 1,000 watts was desirable in all stations, in order to overcome static and give better service to the listeners. This is a question entirely apart from so-called super-power stations, of 25,000 or 50,000 watts, which are not here dealt with.

"I heartily approve increased power in qualified broadcasting stations. Increased power must necessarily give not only better summer, but better winter reception."—E. F. McDonald, Jr., President Zenith Radio Corporation

In order to include increases up to a maximum of 5,000 watts, the Department feels that it should be proceeded upon an experimental basis under strict limitations, which will insure that this development may be without interference with the service of other stations or with the reception now enjoyed by listeners. The Department is receiving many inquiries as to the granting of licenses authorizing this use of increased power.

Licenses for the use, in broadcasting, of power up to 5,000 watts on a purely experimental basis will be issued under the following conditions:

1. Experiments may be carried on

(*Turn to page 93*)

The Radio Première for a chief of the Seminoles down in Florida

World Wide News

Marconi Opens Radio Show—Election Broadcasts—Copyrights and Broadcasting—Radio Manufactures

BY C. S. ANDERSON
Managing Editor of WIRELESS AGE

Marconi Opens Radio Show

MARCONI closed a radio key in England on November 3 at 8 o'clock and flashed a signal which officially opened the third National Radio Exposition at the Grand Central Palace. The energy radiated from the high-power transatlantic wireless station at Carnarvon, Wales, was intercepted at Riverhead, L. I., and passed through a system of relays operating an electrical circuit which lighted an American flag in the Grand Central Palace, New York.

A radiogram from Marconi, read through Stations WJZ, New York; WRC, Washington, and WGY, Schenectady, said:

"It gives me great pleasure to accept the invitation to open the third annual National Radio Exposition of New York, and I feel that I cannot do so more appropriately than by employing the medium of wireless telegraphy to convey a most hearty message of greeting to the radio public of the United States of America.

"Since your exposition last year great strides have been made in the art of broadcasting, both in the United States and in England. There have been important developments in simultaneous broadcasting from several stations, and I believe that on certain occasions in the United States vast audiences of no fewer than 25,000,000 people have listened to a broadcast address. I anticipate that in the not far distant future this great achievement will be surpassed and the broadcasting of messages throughout the world will become a matter of everyday occurrence. We on this side of the Atlantic are looking forward to the day when we shall be able to listen to American speakers on many subjects of common interest. This wireless message brings my best wishes for the success of the exposition which I now have the great pleasure in declaring open."

A message of reciprocal greeting was broadcast by Harold Bolster, director of the exposition, through the same trio of stations.

On November 5 a round the world speed demonstration was given at the Exposition when three letter C's were sent hurtling eastward through the ether at 8:14 P. M. by the Radio Corporation of America, while at the same instant three S's, the letter sent across the Atlantic twenty-three years ago by Marconi in his first tests, were shot out on the ether waves to the west.

In five seconds the three C's had flashed around the world and were back in the Radio Corporation's office at No. 66 Broad Street. A second later, or six seconds in all, the three S's re-

A complete broadcast studio in a window display was a novelty recently presented to New Yorkers by WJZ

turned home, having passed the three C's somewhere on the other side of the globe.

The fact that the round-the-world journey of the S's took a second longer was because there were five relays in the westward circuit and only four in the eastward. Eastward, the relays were St. James, L. I., to Paris, to Saigon, French Indo-China, to San Francisco, to New York. West, they were Tuckerton, N. J., to San Francisco, to Honolulu, to Malabar, Java, to London, to New York. Officials reckoned that a total sending power of 2,250,000 watts was used in the test.

Election Broadcasts

FROM 7 o'clock until 1 o'clock November 4, radio broadcasting stations, for the first time in a Presidential election, transmitted to millions of radio listeners bulletins of the election returns.

Following is a list of the stations which broadcast direct the United Press bulletins. Other stations relayed these reports: WEAF, WJZ, WGY, WGR, WOC, WCCO, KSD, KGO, WGN, WLS, WMAQ, WEBH, WGBS, WIP, WRC, WSAI, KDKA, WCAE, WMC, WBZ, WJAR, WHAS, WSAD, WWJ, WCAP, WNYC, WNAC, WHAM, WAHG, WCX, WSB, WFAN.

Copyrights and Broadcasting

UNITED States District Judge Knox, in the Federal Court for the Southern District of New York, denied the motion of the American Society of Composers, Authors and Publishers, made in the name of Jerome H. Remick & Co., to enjoin the General Electric Company from broadcasting the music of the Society played under authorization of members of the Society by the orchestra at the New Kenmore Hotel in Albany. The point of the decision is, to wit: That whether or not radio broadcasting of musical compositions can, under any circumstances, be a public performance for profit, it is not an infringement where the playing of the musical composition, which is being broadcast, is itself authorized by the owner of the copyright, or by anyone representing him. In other words, it is no infringement for a broadcasting station to broadcast performances of musical compositions by orchestras in hotels or elsewhere, when the playing of the piece by the orchestra is itself authorized. On this subject Judge Knox says:

"By means of the radio art he (the broadcaster) simply makes a given performance available to a great number of persons who, but for his efforts, would not hear it. So far as practical results are concerned, the broadcaster of the authorized performance of a copyrighted musical selection does little more than the mechanic who rigs an amplifier or loud speaker in a large auditorium to the end that persons in remote sections of the hall may hear what transpires upon its stage or rostrum. Such broadcasting merely gives the authorized performer a larger audience and is not to be regarded as a separate and distinct performance of the copyrighted composition upon the part of the broadcaster. When allowance is made for the shrieks, howls and sibilant noises attributable to static and interference, the possessor of a radio receiving set attuned to the station of the broadcaster of an authorized performance, hears only the selection as it is rendered by the performer. The performance is one and the same whether the 'listener in' be at the elbow of the leader of the orchestra playing the selection, or at a distance of a thousand miles."

Prof. Fridtjof Nansen broadcasting a peace talk in Berlin

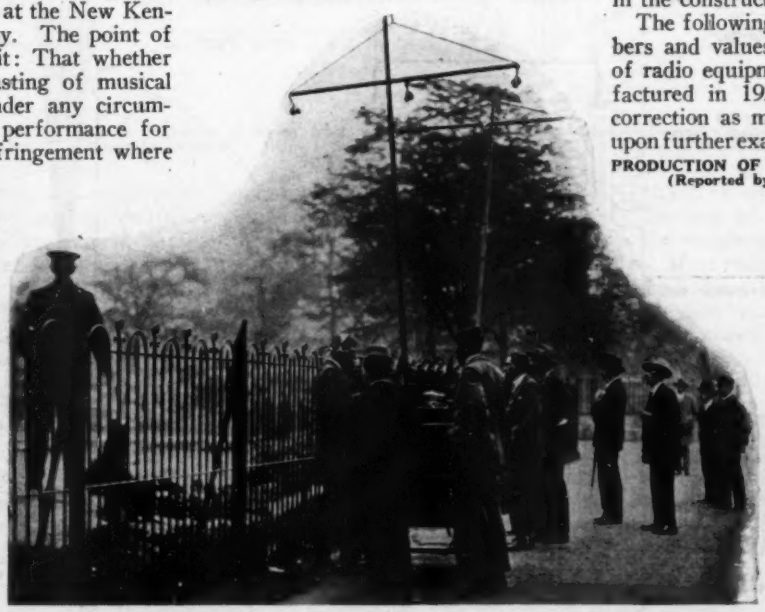
Radio Manufactures

THE Department of Commerce announces that, according to the data collected at the biennial census of manufactures, 1923, radio apparatus to the value of $43,460,676 was manufactured during the year for sale as such. This total includes 1,889,614 head sets, valued at $5,352,441; 508,001 loud speakers, valued at $5,620,961; 414,588 receiving sets of the tube type, valued at $12,065,992; and 116,497 receiving sets of the crystal type, valued at $550,201; together with the other items shown in the table below. The manufacture of 2,601,575 radio tubes, valued at $4,572,251, was reported separately. A part of these tubes were sold to manufacturers to complete receiving sets—and their value is therefore included in the total value of such sets, as given above—and the remainder were sold to individual purchasers for use in the construction of home-made sets.

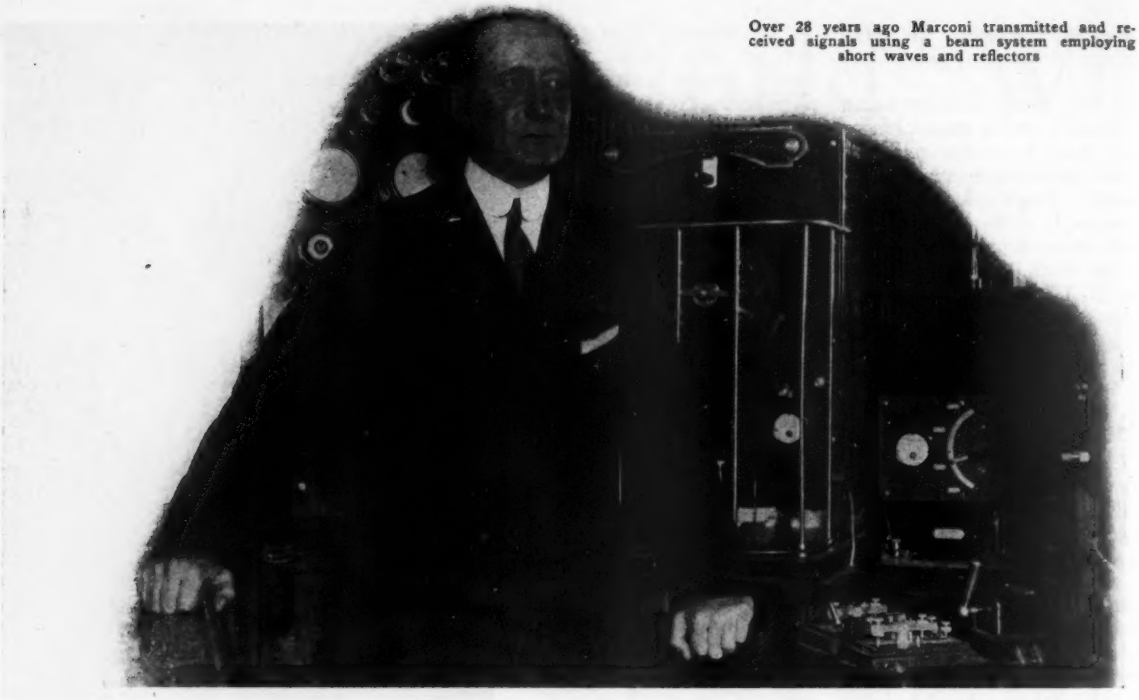
The following table, giving the numbers and values of the several classes of radio equipment reported as manufactured in 1923, is subject to such correction as may be found necessary upon further examination of the returns.

PRODUCTION OF RADIO APPARATUS: 1923
(Reported by 290 establishments)

	Number	Value
Total value		$43,460,676
Loud speakers	508,001	$5,620,961
Head sets	1,889,614	5,352,441
Receiving sets		
Tube type	414,588	12,065,992
Crystal type	116,497	550,201
Transmitting sets	1,073	900,230
Transformers	1,700,024	3,773,213
Rheostats	1,089,721	716,774
Lightning arresters	355,161	196,534
Miscellaneous parts		$14,284,330
Radio Tubes		
Total	2,601,575	$4,572,251
Under 5 watts	2,559,206	3,788,167
5 to 50 watts	15,167	80,529
Over 50 watts	27,202	703,555



London broadcasts include the real atmosphere, in the world of sound, from the menagerie



Over 28 years ago Marconi transmitted and received signals using a beam system employing short waves and reflectors

The Beam System

By K. M. MacILVAIN

THE idea that short wave directional radio telegraphy and telephony, known as "the Beam System," is a new discovery, is erroneous. The study of short electrical waves dates back to the discovery of electrical waves themselves, (e. g. the time that Hertz was carrying on his experiments) over 35 years ago. Hertz proved conclusively in his experiments that these short electrical waves obeyed the same laws as the waves of light in regard to propagation, reflection, refraction and defraction.

Over 28 years ago, Marconi transmitted and received intelligible signals over a distance of 1¾ miles, using a beam system employing short waves and reflectors and showed how it was possible to project the waves in a beam, in one direction only, instead of allowing them to spread out from the transmitter in all directions. The point was brought up at that time as to the feasibility of using this system at lighthouses and lightships to enable ships at sea to locate dangerous points in foggy weather.

Figure 1 is a schematic diagram showing the general arrangement of the apparatus used in these early experiments. The spark gap of the electrical oscillator used was placed in the focal plane of a solid metal reflector as shown in the diagram and the signals from the oscillator could only be picked

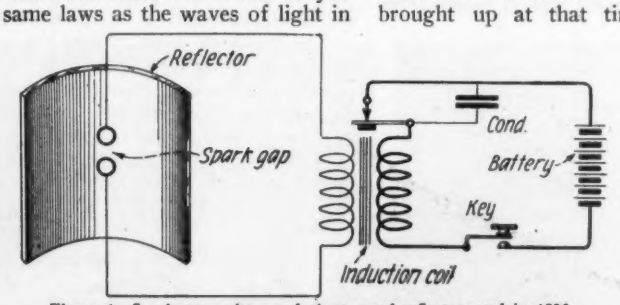


Figure 1—Spark transmitter and sheet metal reflector used in 1896

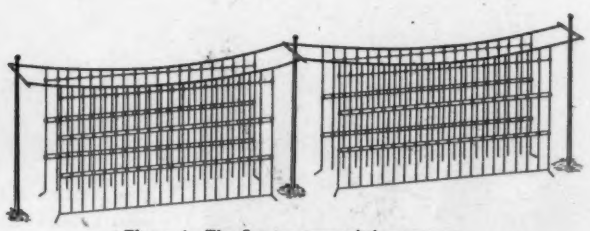


Figure 4—The flat top transmitting antenna

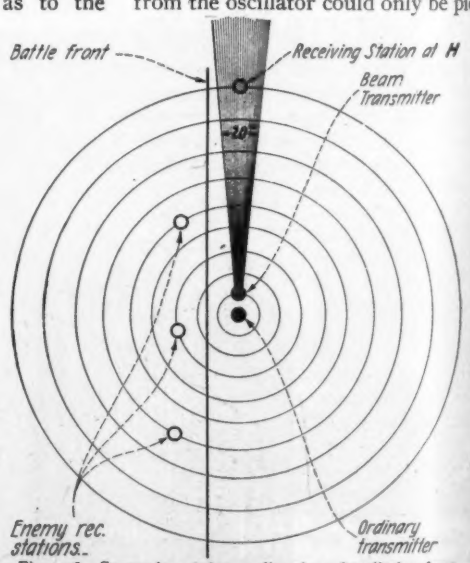


Figure 2—Comparison between direction of radiation from an ordinary transmitter and from the directional transmitter

up in the receiver when the aperture of the transmitting reflector was pointed towards the receiving antenna. The results obtained at this time were discouraging, since the use of reflectors of anywhere near reasonable dimensions necessitated the use of waves of only a few meters in length. Waves of very short length were difficult to produce with the apparatus available at that time and the power that could be radiated by them was small. These factors together with the supposed high attenuation of short waves over any distance of land or sea was enough to discourage the continued research along these lines and the progress subsequently made with the long wave system was so rapid and so comparatively easy that the development of the "Beam System" was forgotten for the time being.

Early in 1916, during the war, the desirability of establishing secret channels of communication along the battle front brought up the question of directional transmission by radio and research again reverted back to "The Beam System." Figure 2 is a diagram showing the comparison between the direction of radiation from an ordinary transmitter and that from the directional transmitter. The value of this latter method of communication in war time is obvious. As shown in the diagram, the three enemy receiving stations just beyond the front line trenches would be within easy range of the signals sent out from the ordinary transmitting station, and of sufficient strength to reach the receiving station at (H.) On the other hand, the beam transmitter could operate at sufficient power to reach the station at (H) and due to the directional characteristics of the emitted waves, none of the enemy stations would be able to pick up these signals. Thus the development of the "Beam Transmitter" progressed. The solid metal reflectors were replaced by a comparatively small number of wires placed parallel to the antenna and spaced around it on a parabolic curve, of which the transmitting antenna constituted the focal line as it was found that this was a more practical arrangement and that much better results could be attained by this method. With the advent of the vacuum tube the short waves were much easier to produce and the power available at these high frequencies was many times greater than that which it was possible to attain with the apparatus available during the early experiments. Figure 3 shows a panoramic view of the transmitting station, the transmitting antenna and the parabolic vertical wire reflector used in the experiments carried on last year (1923.)

Figure 4 shows the flat top transmitting antenna with the vertical wire reflector that was used in the experiments carried on this year (1924.) In this arrangement the antennas and reflector wires are arranged so as to constitute grids parallel to each other, the aerials or antennas being energized simultaneously from the transmitter at a number of feeding points through a special feeding system, so as to insure that the phase of the oscillations in all the wires is the same. The directional effect of such a system as this is a function of its dimensions relative to the wavelength employed.

Most radio experts up to the present time, have had the same general impression regarding the behavior of short waves, namely, that their daytime range is variable and short; that their night-time ranges are variable and freaky, in fact, altogether too much so for their application to commercial traffic; and finally, that their range is quite appreciably reduced by any considerable intervening stretch of land or mountains. Marconi claims that his short wave tests proved that

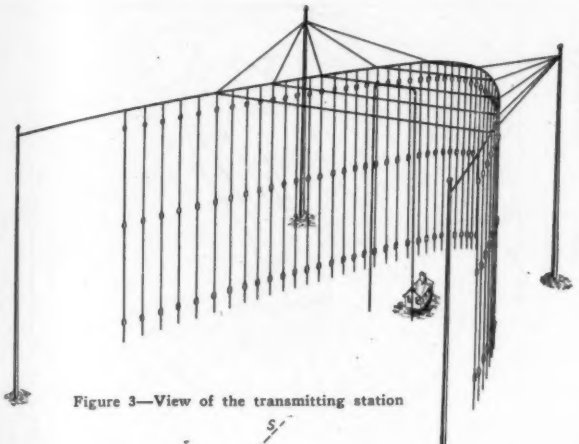


Figure 3—View of the transmitting station

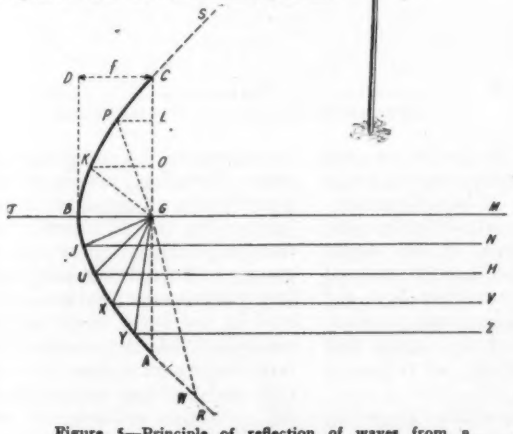


Figure 5—Principle of reflection of waves from a parabolic reflector

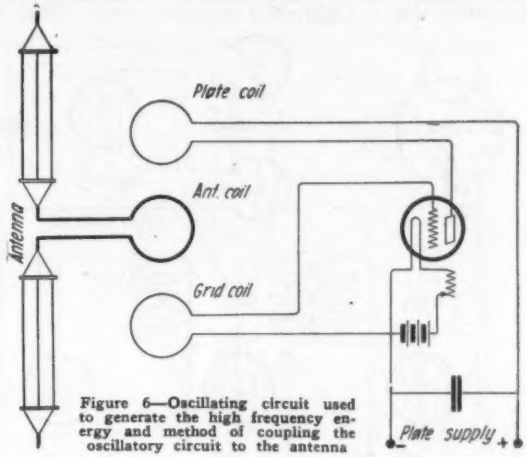


Figure 6—Oscillating circuit used to generate the high frequency energy and method of coupling the oscillatory circuit to the antenna

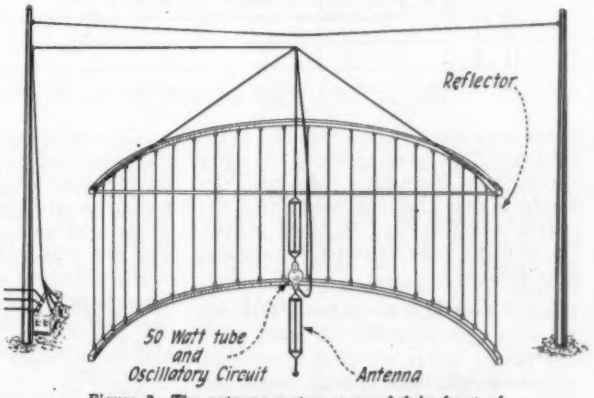


Figure 7—The antenna system suspended in front of the parabolic reflector in such a manner that it forms the focal line of the parabola

the day-time ranges were reliable and not inconsiderable; that the night-time ranges considerably exceeded expectations; and finally that intervening stretches of land and mountains did not present any serious obstacle to the progagation of these waves. Another discovery relative to the transmission of these short waves was that the strength of the signals which could be received during the daytime varied definitely and regularly, in accordance with the mean altitude of the sun over the space or region intervening between the transmitting and receiving stations.

One of the most remarkable scientific results due to Marconi's experiments with short waves was the modification of the coefficient of Austin's transmission formula. Marconi determined that this coefficient was defective when applied to short waves. The transmission formula in question is as follows:

$$I_r = 4.25 \times I_s \times \frac{h_s h_r}{d^{\lambda}} \times e - .0015 \frac{d}{\sqrt{\lambda}}$$

where;

I_r is the effective current in the receiving antenna in amperes.

I_s is the effective current in the transmitting antenna in amperes.

h_s is the effective height of the transmitting antenna in kilometers.

h_r is the eff. height of the receiving antenna in kilometers.

d is the distance between the two antennas in kilometers.

e is the base of the Naperian system of logarithms (2.7183.)

λ is the wavelength in kilometers.

Analyzing the absorption factor $e - .0015 \frac{d}{\sqrt{\lambda}}$ we find that it is an exponential of the form $(e - x)$ where the negative index $(-x)$ is the product of a constant (.0015) multiplied by the ratio of the distance between the stations and the square root of the wavelength used $\left(\frac{d}{\sqrt{\lambda}}\right)$. The results of Marconi's measurements and observations for short wavelengths of the order of 100 meters showed that the constant (.0015) must be replaced by a variable, which is approximately a linear function of the mean altitude of the sun calculated on the great circle track between the transmitting and receiving stations. Thus the coefficient of absorption, for wavelengths of the order of 100 meters, is a function of the time, the seasons and the relative geographical situation of the stations.

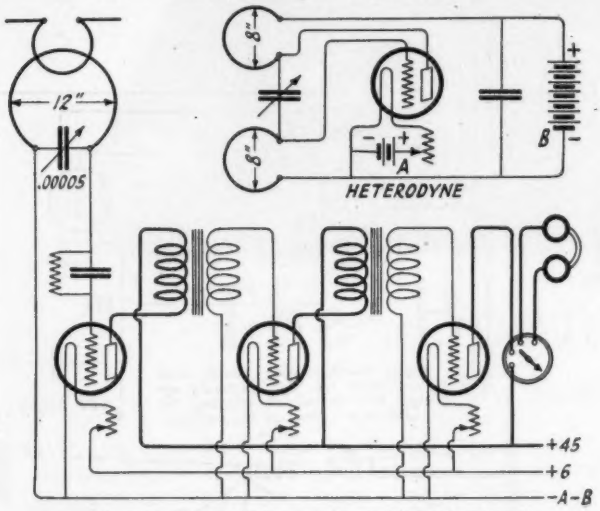


Figure 8—Circuit diagram of the receiving set employed

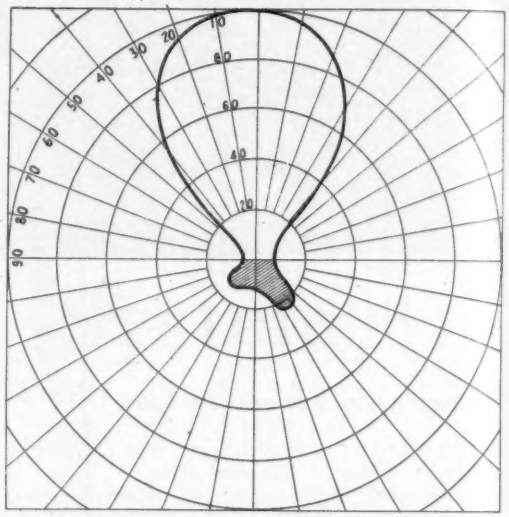


Figure 9—Showing effect of detuned reflecting wires

The enormous value of reflectors was demonstrated by measurements taken during tests of the "Beam Transmitter" over a distance of 100 miles and using a 15 meter wave. It was shown that the value of the energy received when reflectors were used at both the transmitting and the receiving stations, was 200 times that of the energy that could be received in case no reflectors were used.

After reading over the preceding paragraphs, the obvious question that has been predominant in the mind of the reader, is, what is the electrical construction of these reflectors and how do they concentrate the radiated energy in a beam. Figure 5 is the diagram which will be used in explaining the principle of reflection of waves from a parabolic reflector. This, in reality, is the top view of the type of reflector shown in figure 3 which is in the form of a section of a parabolic cylinder. The wave from this form of reflector is somewhat similar to a parallel beam of light which has passed through an opaque screen. Theoretically, if the transmitting antenna is situated in the focal axis (G), the reflected rays will all be parallel (JN, UH, XV, YZ) and will be parallel to the axis of the parabolic cylinder (TM). However, this is the ideal result and is only approximated in practice. The transmitting antenna at the focus (G) is a vertical antenna as shown in figure 3 and the energy radiated from this point is re-radiated by each wire dropped from the parabolic suspension (CBA), figure 5, by virtue of the fact that each one is tuned to G. It follows from the theory of a true parabola that any distance such as (GKO) or (GPL) is equal to GB + BG, thus it is obvious that the re-radiation from all the wires along the parabola (CBA) will reach the aperture CA in phase with each other. Therefore, re-enforcement takes place in the direction GM and interference in the direction BT. Summarizing this action we see that the energy to be radiated originates at the transmitting antenna at G, is re-radiated by the wires suspended from the parabola CBA, these re-radiated waves re-enforcing each other in the direction GM and bucking out in the direction BT. In this analysis we have been considering the ends of the reflector to be at C and A respectively, and therefore energy radiated in the direction GW would not have any part of the reflector in its path and hence would not be diverted from its course, but would continue in the direction GW. Except for leakage, as shown at GW, practically all the energy is reflected over a small angle in the direction GM. Obviously, to minimize the leakage it is only necessary to increase the width of the aperture CA which in other words means the extension of the parabola, as shown at R and S. If this is done the side leakage is reduced and the radiated beam is made narrower.

As is generally known, one of the

serious obstacles in the reception of radio signals is "static." Especially during the summer months is this true. Another generally known fact is that static is not so predominant on the very short wavelengths and at wavelengths as low as 10 meters heavy static is not generally encountered. When long antennas are used the difficulties experienced from static are more predominant than when a short antenna is used. From the foregoing and from some other reasons tending to show the advantages of very short wave transmission, not overlooking the disadvantages encountered on low wavelengths, it is possible to understand the reasoning that prompted experimentation with directive transmitting antennas using wavelengths much lower than 100 meters. Thus during the last couple of years extensive experimentation has been carried on with the "Beam Transmitter" at a wavelength of 10 meters.

Figure 6 shows the oscillating circuit used to generate the high frequency energy and this diagram also shows the method of coupling the oscillatory circuit to the antenna. The Hartley type of oscillatory circuit was employed and a 50-watt tube was used for an oscillator. The plate circuit inductance consisted of one turn of heavy copper wire about 7 inches in diameter and the grid inductance was of the same size. A similar coil was used in series with the antenna as a means of coupling the antenna to the oscillatory circuit. The internal capacity betwen the elements of the tube, together with the external inductance, completed the oscillatory circuit. In fact, this internal capacity determines the upper limits of the frequencies that can be developed. For higher frequencies than this it would be necessary to still further decrease the capacity between the elements by removing the tube from the socket and then removing the base of the tube. If this is done it is possible to get down to a few meters. The antenna system consisted of two cage antennas, each 1.8 meters long joined at the center through the coupling coil. The condenser across the plate supply is simply a radio-frequency by-pass condenser. Figure 7 shows the antenna system suspended in front of the parabolic reflector in such a manner that it forms the focal line of the parabola. The vacuum tube and its associated circuits are mounted in a little cage at the mid-point of the antenna and insulated from it. The power supply leads to the tube are brought from one side, as shown, in a cable. The parabolic reflector was formed by 40 wires, spaced 1 foot apart, in the form of a parabola and each one tuned to a wavelength of 10 meters.

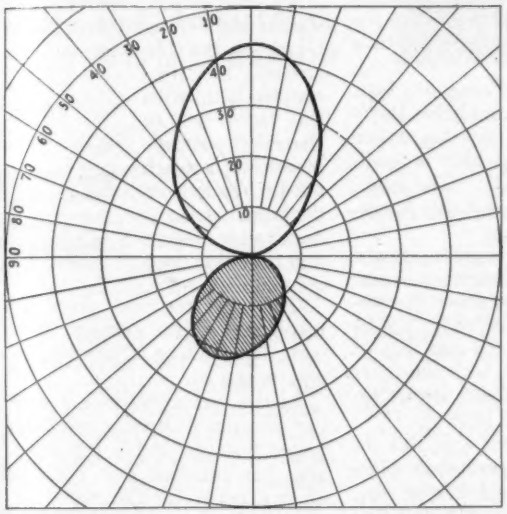


Figure 10—The effect of increasing the frequency of the source

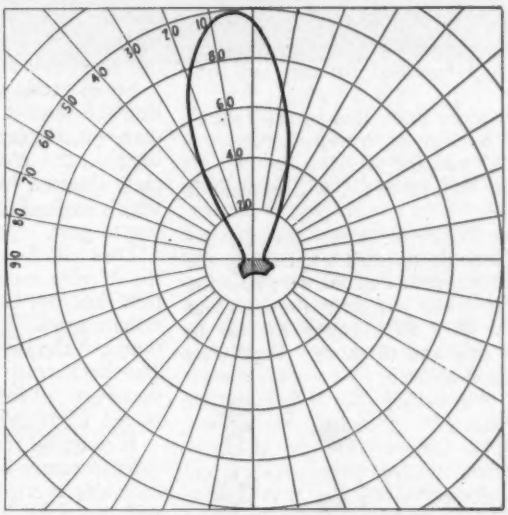


Figure 11—Effect when reflecting wires are tuned

The focal distance (BG, figure 5), was made ¼ of a wavelength, 2.5 meters. The obvious question at this point is, "What type of receiving set was used to receive signals of such a low wavelength?" The receiving set employed is shown in figure 8. The antenna consisted of two vertical pieces of No. 12 copper wire joined at their mid-point by a single turn coil. The secondary coil of this receiver was a single loop of wire 12 inches in diameter and this secondary was tuned by a two-plate variable condenser of .00005 microfarad maximum capacity. Since the waves radiated from the transmitter were unmodulated (of continuous amplitude) it was necessary to use a separate heterodyne to produce an audible beat note in the receivers. This separate oscillator had plate and grid inductances of a single turn each and a two-plate variable condenser was connected from grid to plate. The detector was succeeded by two steps of audio-frequency amplification. By means of this directional transmitter and the receiver described it was possible to obtain some quantitative data relative to the directional characteristics of this type of system. The polar curve shown in figure 9 gives a good idea of the action of the system when the reflecting wires were detuned. In this instance they had not all been cut to the proper length and thus were not all properly tuned to the 10-meter wave radiated at the source. The portion shown in cross section in the diagram is the back-leakage due to the untuned condition of the reflector and the shape of the curve in the direction of propagation is quite broad. When all the wires were tuned to 10 meters, the frequency of the oscillator was increased slightly, thus throwing all the reflecting wires out of tune and the condition produced was worse than in the first case, as would be expected, since some of the reflecting wires, at least, were properly tuned in the first instance. In this last case where all the reflecting wires were out of tune, the radiation in the proper direction was greatly reduced and the radiation through the rear of the reflector was almost one-half that along the true line of reflection, as shown in figure 10. Next, the best possible results were obtained for the 10-meter wavelength with the reflecting wires all in tune and the width of the aperture equal to one wavelength. Figure 11 shows the result. The radiation was found to cover a much narrower band than before and the back leakage had almost entirely disappeared. The width of the beam could be still further decreased by increasing the width of the aperture to two wavelengths and in this case the back leakage would probably very nearly approximate zero.

AFLOAT AND ASHORE WITH THE OPERATOR

By W. S. Fitzpatrick

THE Shipping Board freighter *Nobles* arrived at a Black Sea port recently, and radio operator Bill Hutchins prepared to go ashore. Espying another American steamer, the *Clontorf,* laying close by, he decided to pay a visit. Arriving aboard, he found a young fellow standing outside and looking in through the open radio cabin door surveying the interior.

Now, Hutchins is a rapid-fire talker —not only fast and furious, but continuous.

"You seem interested in the radio," he said, by way of introduction.

"I am," was the reply.

"Well, step in and I will explain it all to you."

It was fifteen or twenty minutes before Hutchins finished explaining the why and wherefore of the set; how the messages come in; how they go out and how they fly through the air to another ship and to shore. Finally he turned and asked:

"Do you belong on this ship?"

"Yes."

"Where's the radio operator?"

"I'm the radio operator."

It was Hutchins' first meeting with Joseph H. Gately, an unassuming fellow who listens graciously and talks little.

* * *

A UNIQUE expedition, financed by several well known men of wealth, has been arranged primarily to salvage treasure lost, when the Ward Liner *Merida* sank off Cape Charles on May 12, 1911.

Two steam trawlers with special equipment are already on the scene. They expect to recover gold bullion and jewels to the value of over four million dollars. The jewels include the famous rubies owned by Empress Marie Charlotte, the mad widow of Emperor Maximilian of Mexico.

This news brings us back to a noted sea disaster, in which radio played its part well, saving the lives of all.

The ship was rammed by the *Admiral Farragut,* and the impact of the collision put the *Merida's* radio out of commission. Operator Leach, on the *Farragut,* experienced similar trouble, but with the assistance of Butler from the *Merida,* soon had the equipment working, and his call for help was heard by Ben Beckerman on the *Hamilton,* as well as by the Norfolk navy yard, which dispatched the battleship *Iowa* and a destroyer.

The *Merida's* passengers and crew—more than 300 in all—were safely transferred to the other vessel, and the liner had gone to her doom by the time the *Hamilton* arrived.

So uncertain was the *Farragut's* fate, that the rescued people, and this ship's own passengers, were quickly taken over on the *Hamilton,* which immediately steamed for Norfolk. The *Iowa,* which arrived later, towed the *Farragut* to port.

Loss of the great treasure aboard the *Merida* caused a newspaper sensation, but did not overshadow the excellent work of the three radio operators, not the least of which was that of Ben Beckerman who, as with the other members of the *Hamilton's* crew, received a month's pay as reward.

It must be remembered that this incident occurred during the time when each ship carried but one operator who, with but very few exceptions, felt that the sea needed no protection at night. Ben Beckerman was one of the exceptions, and his being on the alert at midnight and throughout the whole morning, after receiving the call certainly entitled him to a reward,

* * *

Reflecting back to the ill-fated *Merida,* it is interesting to recall that this was the first American ocean-going passenger vessel to carry wireless equipment on a maiden voyage, when she sailed from New York for Havana on April 21, 1906.

* * *

WE all know what a great part radio played during the world's series closing the 1924 baseball season.

The radio section of the *New York Sun* was elated over the fact that through the use of several loudspeakers "This new application of radio made it possible for copies of *The Sun,* containing the complete story of the game, down to the final put-out in the ninth inning, to appear on the newsstands in less than five minutes after the game had ended."

The Sun concludes with: "Creating what is believed to be a record in the publication by newspapers of the complete box score of a world's series game."

Want to learn of a real record? We must go back twelve years!

The 1912 series was one of the most exciting ever played. What was to be the deciding game was in Boston, and after running over the allotted nine innings, with still a tie score, the game was called on account of darkness.

An enterprising operator at a coast station had arranged with the Western Union to cut his wire in on a press circuit. He then coupled it up with the radio set, so that every play was broadcast through the air—exactly as the broadcasting is done today, except that code was used instead of a voice.

The operator had given notice of his plans, so the present writer, who was then editing a newspaper at sea, was prepared.

In the typewriter was a wax mimeograph stencil sheet in which the newspaper heading and a column of news and personalities had been cut—and all was ready for the game.

It was easy to copy direct "on the mill," and when the last signal was made, it was a matter of a second or two in adjusting the sheet in the mimeograph machine. The steward who was on hand to distribute the paper did the folding, and was off with his first batch in less than one minute!

In broad daylight, all along the decks of the steamer *Momus* were passengers reading every detail of a game "called on account of darkness," while the sun shown far above the horizon! A record! Eh?

This, incidentally, was the first broadcasting of a baseball game by radio.

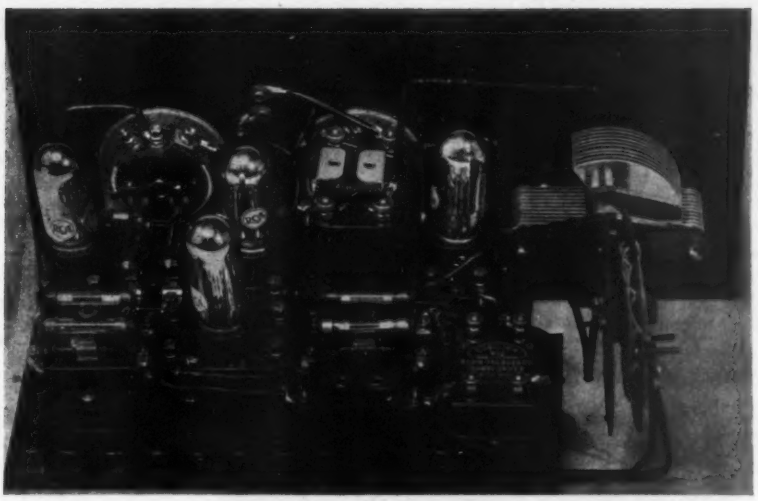
* * *

A similar radio feat occurred on July 4, 1910, when the first prize-fight was broadcast. The writer received every move, every punch, every clinch of the Johnson-Jeffries fight at Reno, and is amused in recalling the joy among the negro stewards on the freighter *Satilla* that night.

Such was radio fourteen years ago—no difference except that the pleasures of "wireless" were then limited to a few, while now almost everybody has a "radio."

THE Radio Lyre

A Receiver Built to Produce Tone Quality Using a Crystal Detector and Resistance Coupled Amplification



By O. B. SCOTT

THE prevailing tendency in receivers has been more and more away from the multi-dialed, squealing machines of recent times to simple, sweet-toned instruments that will make the reception of broadcast music a pleasure that everyone may easily enjoy.

With this thought in mind, the writer planned a set that would be so simple in operation that a child could tune it; so exact in tone reproduction that an artist could appreciate it. To accomplish these things, regeneration and multi-stage transformer coupled amplification were discarded in favor of a crystal detector with resistance coupled amplification.

The completed receiver has four UV-199 tubes. The first tube is reflexed, amplifying at radio and audio frequency. The other three tubes amplify at audio frequency by means of resistance coupling. The only tuning control is the variable condenser across the secondary of the antenna coupler. The coupler is so designed that the tuning is very selective.

The one-tube reflex with the crystal detector was selected for its well-known tone quality. However, most one and two-tube crystal reflex receivers do not give sufficient volume to satisfy the most exacting listeners. To attempt to amplify the output by transformer-coupling would lessen the initial purity of tone. Audio-frequency transformers do not amplify all voice frequencies equally. The impedance of the windings varies with the frequency of the voice currents, so that certain tones and overtones will be accentuated in the loudspeaker. In a multi-stage amplifier this condition would be very noticeable. Even with two stages of transformer-coupled audio frequency amplification, distortion is overcome only by the use of the very best grade of transformers.

On the other hand, a resistance coupled system will amplify equally all moderate frequencies. The only chance for distortion to occur with resistance coupling is in the grid and plate filament capacities of the tubes. This can obtain only at frequencies well over ten kilocycles. Since the upper limit of audio frequency is about five kilocycles,

(*Turn to page* 85)

MATERIAL

One 7x14 panel, Radion
One 4-inch dial, Radion
One 23 plate variable condenser, Pacent
Two 4-inch spiderweb forms
One-eighth lb. No. 28 DSC wire
One-eighth lb. No. 18 DSC or DCC wire
One 7x10 sub-panel, Radion
Two Se-ar-de aluminum brackets
One low ratio audio frequency transformer
One Radio-frequency transformer, Dubilier Duratran
Two 20-ohm rheostats, Pacent
Four sockets for UV-199 tubes
Three Daven resisto-couplers
One Daven condenser mounting
Three Daven 100,000-ohm resistances
Three grid leaks, 2, 1 and .5 megohm
One Pacent 65 filament control jack
One Pacent 66 filament control jack
Two .0025 Micadons
Two .00025 Micadons
One .005 Micadon
One good crystal detector, Grewol
Binding posts, strip brass, bus bar, nuts, bolts, etc.
Tubes and batteries

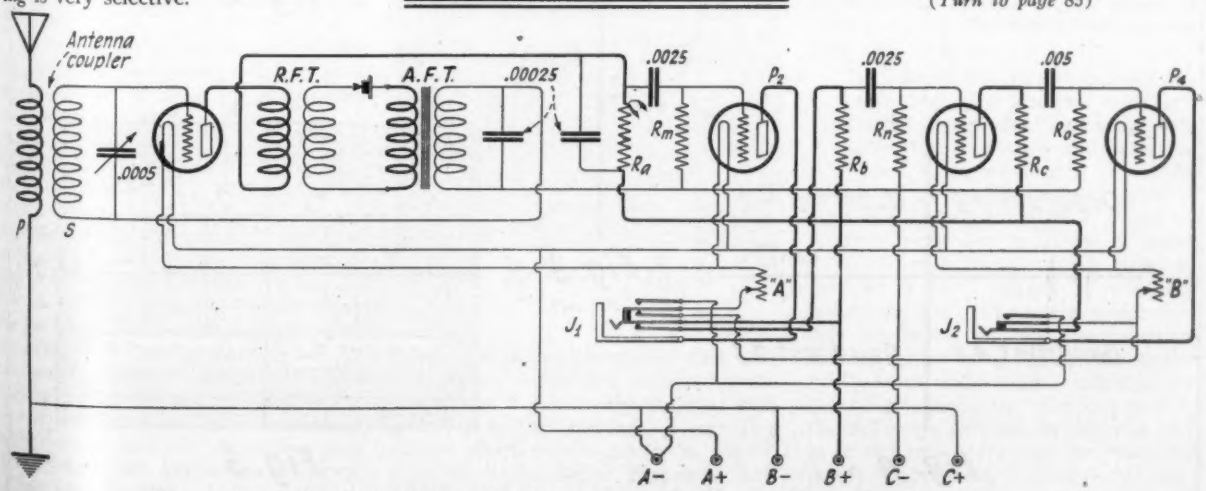


Figure 1—Circuit diagram of the one-step R. F. crystal detector and three-step resistance coupled A. F. receiver.

Figure 6

An Introduction to the

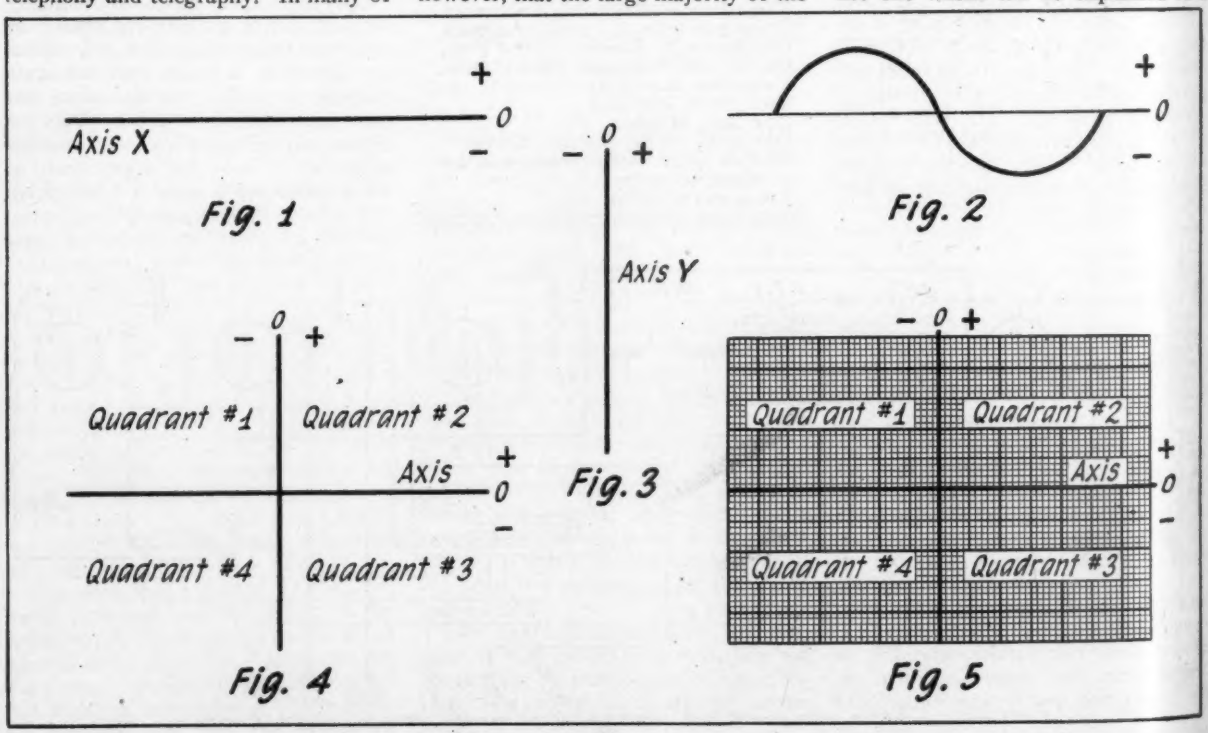
Mysteries of the Vacuum Tube

Learn Without Mathematics How Your Tubes Function—Experimental Methods and Determination of Tube Curves—The Interpretation and Application of These Curves

By DONALD GORDON WARD
Technical Instructor, Radio Institute of America

WITH the advent of the vacuum tube in radio communciation, there have been written and published a large number of articles upon the operation of the vacuum tube as a detector, as a radio-frequency amplifier, as an audio-frequency amplifier, as an oscillator for the generation of radio frequency currents, and as a modulator or control device in radio telephony and telegraphy. In many of these articles reference has been made to the operation of these devices from the point of view of their so-called characteristic curves of operation, but in practically all of these articles it has been assumed that the reader of the article was fully able to comprehend the meaning of these curves and how to take them and how to apply them after they were taken. It is to be recognized, however, that the large majority of the owners of receiving sets would like to know just how their tubes function without the necessity of studying the mathematical formulas used in connection with the operation of the tubes, and would also like to be able to interpret their curves of operation in a simple, non-mathematical manner, and, therefore, the reason for this article.

The subject of the vacuum tube is not one which can be explained in a



clear and concise manner in a mere paragraph of a few hundred words, as the tube itself can be employed in numerous functions in radio itself, and also in many other places entirely foreign to the radio art. This article, therefore, will be the first of several which will deal with the operation of the vacuum tube in places which are of interest to the broadcast listener, and the first article will confine itself to the methods of experimentation and determination of the tube curves and to the interpretation and application of these curves after they have been constructed.

The basis for all curves lies upon two axes, the X axis as in figure 1 and the Y axis as in figure 3. All values above the X or horizontal axis are to be taken as positive values, and all values below the X axis are to be taken as negative values, with respect to that axis. Positive values and negative values are merely relative conditions, that is, if one direction is arbitrarily taken as a positive direction the opposite direction is a negative direction. Positive and negative directions, therefore, become absolute directions only when they are taken with reference to some fixed point in a circuit, such as, for example, the plate element of the vacuum tube. In the case of an alternating current, as illustrated in the curve, figure 2 which illustrates one cycle of events in the life of an alternating current, it consists of two parts or alternations, one above the X axis, and, therefore, positive in value, and the other below the X axis, and, therefore, negative in value. The reference, in this case, is to an arbitrary condition which is generally accepted, and that is a condition of no energy in the circuit. In the case of the Y axis, as illustrated in figure 3, all points to the left of this axis are negative, and points to the right of it are positive in value.

If, therefore, we make a combination of these two axes as in figure 4, we have now a basis for connecting two variable conditions together, such as the grid potential in a vacuum tube and the plate current in the same tube, and noting how these two quantities vary in their relationship one to another, therefore, illustrating to us as to just what will happen to one condition when we vary the other; of course, this is provisional upon the fact that the varying of one condition does vary the other, as otherwise there would be no possible manner of connecting them together. This condition is true in the case of the vacuum tube and many other devices, and it is, therefore, possible to construct performance curves of any such devices.

In figure 4, which is divided into four quadrants: Quadrant number 1 contains values which are positive to the X axis, as this quadrant lies above the X axis, and values which are negative to the Y axis, as it lies to the left of the Y axis; quadrant number 2 contains values which are positive to the X axis, as it lies above that axis, and also values which are positive to the Y axis, as it lies to the right of that axis; quadrant number 3 contains values which are negative to the X axis, as it lies below that axis, and values which are positive to the Y axis, as it lies to the right of the Y axis. And, finally, quadrant number 4 contains values which are negative to both the X and Y axes, as it contains values which are to the left of the Y axis, and, therefore, negative with respect to it and, quantities which are below the X axis and which are therefore negative with respect to this axis

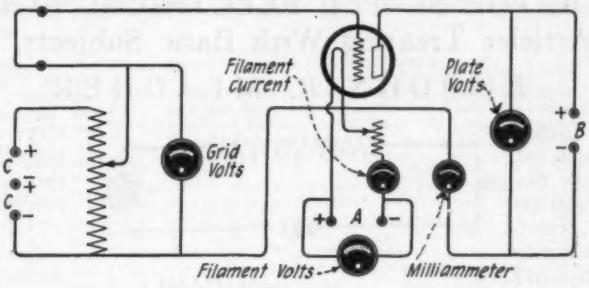


Figure 7

Volts Grid	Plate M. A.
—25	0.10
—20	0.15
—15	0.20
—10	0.25
— 5	0.50
0	1.35
+ 5	2.70
+10	4.40
+15	5.40
+20	5.70
+25	5.75

Figure 8

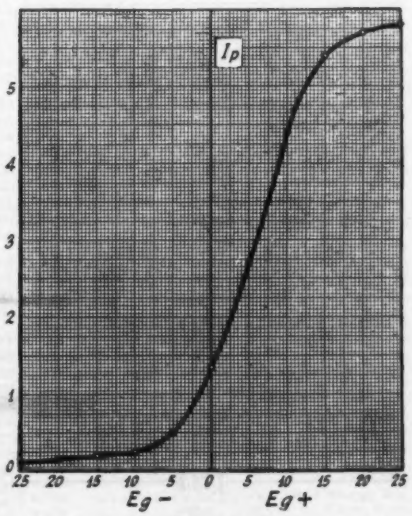


Figure 9

This pair of crossed axes is constructed upon what is known as cross-section paper as illustrated in figure 5, the purpose of this cross sectioning being so that it is possible to assign numerical values to each small section of the paper, thus laying out our numerical values in such distances of separation mechanically as they are separated mathematically. The particular scale to be chosen is a purely arbitrary problem for each curve to be drawn, and should be chosen so that the spaces are as large as possible, still having the curve entirely on one sheet of paper, as the larger the dimensions of the curve the easier it can be read and the greater the accuracy of our result.

Let us now study the method of finding these curves and constructing them by experimentation. The first piece of apparatus that we shall need will be an instrument that will give us readings of the various quantities that will enter into the make-up of our curve and some method of varying one of these quantities, while we are observing what will happen to any other quantity. Let us, for example, make a test of the value of plate current which would result from a variation of grid potential. This is the commonest of all of the characteristic curves of the vacuum tube and the one which is most commonly used in explanation of the functioning of the tube, either as an amplifier or as a detector, and it will be with this curve that we will deal in the second article of this series in explaining the operation of the vacuum tube as a detector.

The instruments used in making this curve consist of a filament voltmeter, filament ammeter, plate voltmeter, plate milliammeter, and grid voltmeter, as illustrated in figure 6, and it will be connected as per the diagram figure 7. As will be noted in figure 7, a pair of binding posts are included in series with the grid circuit of the tube, in case we wish to employ a meter for measuring the grid current under certain conditions, and for the construction of certain tube curves, but as the grid current under most conditions will be in the order of the micro-ampere or the millionth part of the ampere and as it requires a very delicate and expensive instrument to observe this very

(*Turn to page* 89)

FILAMENT CIRCUITS EXPLAINED

IN THE LIGHT OF THE SIMPLE ELECTRICAL ACTIONS INVOLVED

The First Of Two Articles Treating With Basic Subjects, Basically Presented

By JOHN R. MEAGHER

THE subject of filament circuits has been more or less neglected. This is unfortunate, as the filament circuit plays a very important part in the operation of radio receivers; a part that is usually underestimated and the action of which is not generally known. This situation is very peculiar in view of the fact that only simple electrical actions are involved.

Let us look into the subject and see if it can not be presented in a simple manner.

First, let us see what is meant by "volts" and "ohms" and "amperes."

Voltage is the measure of applied electrical force.
Amperage is the measure of current.
Ohmage is the measure of resistance.

We do not have to worry over the value of the volt or the ohm or the ampere—they were selected arbitrarily and mean little to us.

Consider the voltage to be the main one of the three—for on the force of voltage depends the value of current that may be passed through a certain ohmage resistance. If the voltage is kept constant and the resistance changed, the current will change. Or, if the resistance is fixed and the voltage changed, then the current will change. But there is no way of changing the current to make a change in the voltage or the resistance; the current depends upon the other two factors.

With direct current—where the voltage does not vary—a simple relationship exists between the voltage, current and resistance that may be expressed in this way:

The voltage divided by the resistance equals the current rate.
Or, the applied voltage divided by the current equals the value of resistance.

Let us try applying these rules to a few cases. Look at (A) figure 1—Here a battery (or source of force) V is connected to a resistance R—a direct current ammeter being included in one lead from the battery. We will consider the resistance of the meter and leads as zero.

Assign a value of 6 volts to the battery; what resistance should R have to keep the current at ½ ampere? (From the rules, the voltage divided by the current equals the resistance so 6 ÷ 5 = 1.2 ohms.

Say the voltage is 3; what must the resistance be to keep the current at 10 amperes? (3 ÷ 10 = .3 ohms.)

Let us suppose the voltage is 6 and the resistance 25 ohms; what current will the meter register? Here we know the voltage and the resistance: To find the current. Voltage (6) divided by resistance (25) equals the current, .24 ampere.

Circuits that appear more difficult are apt to mix one up—but really they may all be easily reduced to the simple circuit of (A).

In (B) figure 1, for instance, if the values of R1, R2 and R3 are alike, their total effective resistance will be ⅓ of any one of them as the conducting area of 3 is just 3 times as great as the area of 1. If R1, R2 and R3 are not alike in resistance, the method of computing their effective resistance is different. The method is purposely omitted here in order to avoid confusion. In radio filament circuits the parallel resistances are usually equal in value. The effective resistance of the three branched or parallel resistances added to the resistance value of R gives the total circuit resistance.

Suppose in (C) figure 1, that R1, R2 and R3 are filaments of UV-201A tubes—what is their effective resistance? The resistance of one UV-201A filament, computed from the proper terminal voltage of 5 and the resultant current of .25 ampere, is 20 ohms. Then three in parallel offer a resistance of 20 ÷ 3 or about 6.66 ohms.

Now let V equal 6 volts with R1, R2 and R3 still representing filaments of UV-201A tubes, the effective resistance of all three being 6.66 ohms. We must permit a current of three-quarters ampere to flow through the circuit as each filament requires one-quarter ampere and three in parallel require three times as much. Knowing the voltage and the desired current we may readily find the proper value of total resistance by dividing the voltage by the current. We find that the total

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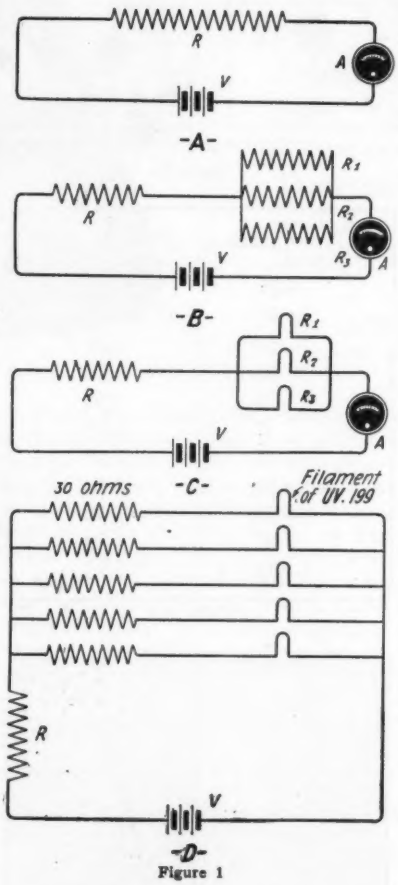


Figure 1

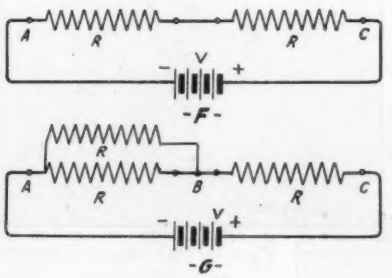


Figure 2

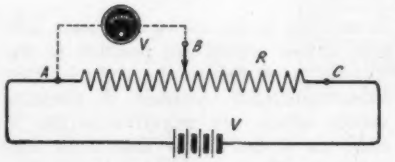


Figure 3

BROADCASTING STATION DIRECTORY

The Most Authentic, Up-to-the-Minute List of Stations Broadcasting in the United States, Canada, England, France and Cuba

KDKA	Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.	326
KDPM	Westinghouse Elec. & Mfg. Co., Cleveland, O.	270
KDPT	Southern Electrical Co.....San Diego, Calif.	244
KDYL	Newhouse Hotel.....Salt Lake City, Utah	360
KDYM	Savoy Theater.....San Diego, Calif.	280
KDYQ	Oregon Institue of Technology....Portland, Ore.	360
KDYW	Smith Hughes & Co.....Phoenix, Ariz.	360
KDZB	Frank E. Siefert.....Bakersfield, Calif.	240
KDZE	Rhodes Department Store.....Seattle, Wash.	270
KDZF	Automobile Club of Southern Calif., Los Angeles, Calif.	278
KDZR	Bellingham Publishing Co...Bellingham, Wash.	261
KFAD	McArthur Bros. Mercantile Co., Phoenix, Ariz.	360
KFAE	State College of Washington...Pullman, Wash.	330
KFAF	Western Radio Corp.....Denver, Colo.	360
KFAJ	University of Colorado.....Boulder, Colo.	360
KFAR	Studio Lighting Service Co....Hollywood, Calif.	280
KFAW	The Radio Den.....Santa Ana, Calif.	268
KFAY	Virgin's Radio Service.....Medford, Ore.	283
KFBB	F. A. Buttrey & Co.....Havre, Mont.	360
KFBC	W. K. Azbill.....San Diego, Calif.	278
KFBE	Reuben H. Horn.....San Luis Obispo, Calif.	360
KFBG	First Presbyterian Church.....Tacoma, Wash.	360
KFBK	Kimball-Upson Co.....Sacramento, Calif.	283
KFBL	Leese Bros. .....Everett, Wash.	224
KFBS	Trinidad Gas & Electric Supply Co. and The Chronicle News, Trinidad, Colo.	280
KFBU	The Cathedral .....Laramie, Wyo.	283
KFCB	Nielsen Radio Supply Co.....Phoenix, Ariz.	238
KFCF	Frank A. Moore.....Walla Walla, Wash.	360
KFCH	Elect. Service Station.....Billings, Mont.	360
KFCL	Leslie E. Rice.....Los Angeles, Calif.	236
KFCM	Richmond Radio Shop.....Richmond, Calif.	244
KFCP	Ralph W. Flygare.....Ogden, Utah	360
KFCV	Fred Mahaffey, Jr.....Heuston, Tex.	360
KFCZ	Omaha Central High School.....Omaha, Nebr.	258
KFDD	St. Michaels Cathedral.....Boise, Idaho	252
KFDH	University of Arizona.....Tucson, Ariz.	268
KFDJ	Oregon Agricultural College....Corvallis, Ore.	360
KFDL	Knight Campbell Music Co.....Denver, Colo.	226
KFDX	First Baptist Church.....Shreveport, La.	360
KFDY	South Dakota State College of Agriculture, Brookings, S. D.	273
KFDZ	Harry O. Iverson.....Minneapolis, Minn.	231
KFEC	Meier & Frank Co.....Portland, Ore.	248
KFEJ	Guy Greason.....Tacoma, Wash.	360
KFEL	Winner Radio Corp.....Denver, Colo.	254
KFEQ	Scroggin & Co. Bank.....Oak, Nebr.	268
KFER	Auto Electric Service Co.....Fort Dodge, Iowa	231
KFEX	Augsburg Seminary .....Minneapolis, Minn.	261
KFEY	Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho	360
KFFB	Jenkins Furniture Co.....Boise, Idaho	240
KFFE	Eastern Oregon Radio Co.....Pendleton, Ore.	360
KFFP	First Baptist Church.....Moberly, Mo.	266
KFFR	Nevada State Journal.....Sparks, Nev.	226
KFFV	Graceland College.....Lamoni, Iowa	360
KFFY	Pineus & Murphey.....Alexandria, La.	275
KFGC	Louisiana State University...Baton Rouge, La.	254
KFGD	Chickasha Radio & Electric Co., Chickasha, Okla.	248
KFGH	Leland Stanford Junior University, Stanford University, Calif.	273
KFGL	Snell & Irby.....Arlington, Ore.	234
KFGQ	Crary Hardware Co.....Boone, Iowa	226
KFGX	First Presbyterian Church.....Orange, Tex.	250
KFGZ	Emmanuel Missionary College, Berrien Springs, Mich.	268
KFHA	Western State College of Colo., Gunnison, Colo.	252
KFHD	Utz Electric Shop Co.....St. Joseph, Mo.	226
KFHH	Ambrose A. McCue.....Neah Bay, Wis.	261
KFHJ	Fallon & Co.....Santa Barbara, Calif.	360
KFHB	Star Electric & Radio Co.....Seattle, Wash.	240
KFHS	Clifford J. Dow.....Lihue, Hawaii	275
KFI	Earle C. Anthony (Inc.)....Los Angeles, Calif.	469
KFIF	Benson Polytechnic Institute.....Portland, Ore.	360
KFIO	North Central High School.....Spokane, Wash.	252
KFIQ	First Methodist Church.....Yakima, Wash.	242
KFIU	Alaska Elec. Light & Power Co., Juneau, Alaska	226
KFIX	Reorganized Church of Jesus Christ of Latter Day Saints, Independence, Mo.	240
KFIZ	Daily Commonwealth and Oscar A. Huelsman, Fond du Lac, Wis.	273
KFJB	Marshall Electric Co.....Marshalltown, Iowa	248
KFJC	Seattle Post Intelligencer.....Seattle, Wash.	270
KFJF	National Radio Mfg. Co.....Oklahoma, Okla.	252
KFJI	Liberty Theater .....Astoria, Ore.	252
KFJK	Delano Radio & Electric Co....Bristow, Okla.	233
KFJL	Hardaseg Mfg. Co.....Ottumwa, Iowa	242
KFJM	University of North Dakota, Grand Forks, N. D.	280
KFJQ	Electric Construction Co., Valley Radio Division, Grand Forks, N. D.	280
KFJR	Ashley C. Dixon & Son.....Stevensville, Mont.	258
KFJV	Le Grande Radio Co.....Towanda, Kansas	226
KFJX	Iowa State Teachers' College, Cedar Falls, Iowa	280
KFJY	Tunwall Radio Co.....Fort Dodge, Iowa	246
KFJZ	Texas National Guard, 112th Cavalry, Fort Worth, Tex.	254
KFKA	Colorado State Teachers College, Greeley, Colo.	273
KFKB	Brinkley-Jones Hospital Assn.....Milford, Kans.	286
KFKQ	Conway Radio Laboratories.....Conway, Ark.	250
KFKV	F. F. Gray.....Butte, Mont.	283
KFKX	Westinghouse Elec. & Mfg. Co., Hastings, Nebr.	281
KFKZ	Nassour Bros. Radio Co., Colorado Springs, Colo.	234
KFLA	Abner R. Willson.....Butte, Mont.	283
KFLB	Signal Electric Mfg. Co.....Menominee Mich.	248
KFLD	Paul E. Greenlaw.....Franklinton, La.	234
KFLE	National Educational Service.....Denver, Colo.	268
KFLQ	Bizzell Radio Shop.....Little Rock, Ark.	261
KFLR	Korber Wireless Station, Albuquerque, N. Mexico	254
KFLU	Rio Grande Radio Supply House, San Benito, Tex.	236
KFLV	Swedish Evangelical Mission Church, Rockford, Ill.	229
KFLW	Missoula Elect. Co.....Missoula, Mont.	234
KFLX	George R. Clough.....Galveston, Tex.	240
KFLY	Fargo Radio Supply Co.....Fargo, N. Dak.	231
KFLZ	Atlantic Automobile Co.....Atlantic, Iowa	273
KFMB	Christian Churches of Little Rock, Little Rock, Ark.	254
KFMQ	University of Arkansas.....Fayetteville, Ark.	263
KFMR	Morningside College .....Sioux City, Iowa	261
KFNT	George W. Young.....Minneapolis, Minn.	231
KFMW	M. G. Sateren.....Houghton, Mich.	226
KFMX	Carleton College.....Northfield, Minn.	293
KFNF	Henry Field Seed Co.....Shenandoah, Iowa	266
KFNG	Wooten's Radio Shop.....Coldwater, Miss.	254
KFNJ	Warrensburg Electric Shop...Warrensburg, Mo.	234
KFNL	Radio Broadcast Assn.....Paso Robles, Calif.	240
KFNV	L. A. Drake.....Santa Rosa, Calif.	234
KFNY	Montana Phonograph Co.....Helena, Mont.	261
KFNZ	Royal Radio Co.....Burlingame, Calif.	231
KFOA	Rhodes Co. .....Seattle, Wash.	455
KFOC	First Christian Church.....Whittier, Calif.	236
KFOD	The Radio Shop.....Wallace, Idaho	224
KFOF	Rohrer Elec. Co.....Marshfield, Ore.	240
KFOJ	Moberly High School Radio Club, Moberly, Mo.	246
KFOL	Leslie M. Schafbuch.....Marengo, Iowa	234
KFON	Echophone Radio Shop.....Long Beach, Calif.	234
KFOO	Latter Day Saints University, Salt Lake City, Utah	261
KFOR	Ora W. Chancellor.....Galveston, Tex.	240
KFOR	David City Tire & Elec. Co., David City, Nebr.	226
KFOT	College Hill Radio Club.....Wichita, Kans.	231
KFOU	Hommel Mfg. Co.....Richmond, Calif.	254
KFOV	David Elect. Corp. .....Sioux City, Iowa	234
KFOX	Technical High School.....Omaha, Nebr.	248
KFOY	Beacon Radio Service.....St. Paul Minn.	226
KFOZ	Leon Hudson Real Estate Co..Fort Smith, Ark.	233
KFPB	Edwin J. Brown.....Seattle Wash.	224
KFPG	Garretson & Dennis.....Los Angeles, Calif.	238
KFPH	Harold C. Mailander.....Salt Lake City, Utah	242
KFPL	C. C. Baxter.....Dublin, Tex.	242
KFPM	New Furniture Co.....Greenville, Tex.	242
KFPN	Missouri National Guard, 70th Infantry Brigade, Jefferson City, Mo.	242
KFPO	Colorado National Guard, 45th Divisional Tank Co., Denver, Colo.	231
KFPP	G. & G. Radio & Electric Shop, Olympia, Wash.	236
KFPR	Los Angeles County Forestry Department, Los Angeles, Calif.	231
KFPT	Cope & Johnson.....Salt Lake City, Utah	268
KFPV	Heintz & Kohlmoos.....San Francisco, Calif.	236
KFPW	St. Johns Church.....Cartersville, Mo.	268
KFPX	First Presbyterian Church.....Pine Bluff, Ark.	242
KFPY	Symons Investment Co.....Spokane, Wash.	283
KFQA	The Principia .....St. Louis, Mo.	261
KFQB	Searchlight Publishing Co....Fort Worth, Tex.	254
KFQC	Kidd Brothers Radio Shop.....Taft, Calif.	227
KFQD	Chovin Supply Co.....Anchorage, Alaska	280
KFQE	Dickenson-Henry Radio Laboratories, Colorado Springs, Colo.	224
KFQF	Donald A. Boult.....Minneapolis, Minn.	224
KFOF	Rohrer Elec. Co.....Marshfield, Ore.	240
KFQG	Southern California Radio Assn, Los Angeles, Calif.	226
KFQH	Radio Service Co.....Burlingame, Calif.	231
KFQI	Thomas H. Ince Corp.....Culver City, Calif.	234
KFQJ	Harbour-Longmire Co. .....Oklahoma, Okla.	236
KFQK	Democrat Leader .....Fayette, Mo.	236
KFQL	Oklahoma Free State Fair Assn., Muskogee, Okla.	252
KFQM	Texas Highway Bulletin.....Austin, Tex.	268
KFQN	Third Baptist Church.....Portland, Ore.	283
KFQO	Meier Radio Shop.....Russell, Kans.	261
KFQP	George S. Carson, Jr.....Iowa City, Iowa	224
KFQR	Walter L. Ellis.....Oklahoma, Okla.	250
KFQS	Dickenson-Henry Radio Laboratories, Manitou, Colo.	246
KFQT	Texas National Guard, 36th Signal Company, Denison, Tex.	252
KFQU	W. Riker.....Holy City, Calif.	234
KFQV	Omaha Grain Exch.....Omaha, Neb.	231
KFQW	Photo Radio and Elect. Shop, North Bend, Wash.	248
KFQX	Alfred M. Hubbard.....Seattle, Wash.	233
KFQY	Farmers State Bank.....Belden, Neb.	273
KFQZ	Taft Radio Co.....Hollywood, Calif.	240
KFRA	Marwin S. Olson.....Carver, Minn.	240
KFRB	Hall Bros .....Beeville, Texas	248
KFRC	Radicart Studio .....San Francisco, Calif.	280
KFRE	The Radio Shop.....Grafton, N. D.	
KFRF	W. R. Brown.....Alexandria, La.	
KFRG	Cleveland High School.....St. Louis, Mo.	
KFSG	Echo Park Evangelistic Assn, Los Angeles, Calif.	278
KFSY	Van Biaricom Co.....Helena, Mont.	261
KGB	Tacoma Daily Ledger.....Tacoma, Wash.	252
KGG	Hallock & Watson Radio Service, Portland, Ore.	360
KGO	General Electric Co.....Oakland, Calif.	312
KGU	Marion A. Mulrony.....Honolulu, Hawaii	360
KGW	Portland Morning Oregonian....Portland, Ore.	492
KGY	St. Martins College.....Lacey, Wash.	258
KHJ	Times-Mirror Co. .....Los Angeles, Calif.	395
KHQ	Louis Wasmer (Excelsior Motorcycle & Bicycle Co.), Seattle, Wash.	360
KJQ	C. O. Gould.....Stockton, Calif.	273
KJR	Northwest Radio Service Co....Seattle, Wash.	283
KJS	Bible Inst. of Los Angeles, Los Angeles, Calif.	360
KLS	Warner Brothers Radio Supplies Co., Oakland, Calif.	360
KLX	Tribune Publishing Co.....Oakland, Calif.	509
KLZ	Reynolds Radio Co.....Denver, Colo.	263
KMJ	San Joaquin Light & Power Corp., Fresno, Calif.	248
KMO	Love Electric Co.....Tacoma, Wash.	360
KNT	Walter Hemrich .....Kukak Bay, Alaska	263
KNX	Electric Lighting Supply Co..Los Angeles, Calif.	360
KNY	Radio Supply Co.....Los Angeles, Calif.	256
KOB	New Mexico College of Agriculture and Mechanic Arts, State College, N. Mex.	360
KOP	Detroit Police Department.....Detroit, Mich.	296
KPO	Hale Bros. .....San Francisco, Calif.	423
KQP	Apple City Radio Club.....Hood River, Ore.	360
KQV	Doubleday-Hill Electric Co.....Pittsburgh, Pa.	270
KQW	Charles D. Herrold.....San Jose, Calif.	360
KRE	Berkeley Daily Gazette.....Berkeley, Calif.	275
KSD	Post Dispatch .....St. Louis, Mo.	546
KSS	Prest and Dean.....Long Beach, Calif.	360
KTW	First Presbyterian Church.....Seattle, Wash.	360
KUO	Examiner Printing Co.....San Francisco, Calif.	360
KUS	City Die Works.....Los Angeles, Calif.	360
KUVQ	Kreetan Co.....Drummond Island, Mich.	450
KUY	Coast Radio Co.....El Monte, Calif.	256
KWG	Portable Wireless Telephone Co...Stockton, Calif.	360
KWH	Los Angeles Examiner.....Los Angeles, Calif.	360
KXD	Modesto Herald.....Modesto, Calif.	252
KYQ	The Electric Shop.....Honolulu, Hawaii	270
KYW	Westinghouse Elec. & Mfg. Co....Chicago, Ill.	536
KZM	Preston D. Allen.....Oakland, Calif.	360
KZN	The Desert News.....Salt Lake City, Utah	360
WAAB	Valdemar Jensen .....New Orleans, La.	268
WAAC	Tulane University .....New Orleans, La.	360
WAAD	Ohio Mechanics Institute.....Cincinnati, Ohio	360
WAAF	Chicago Daily Drovers Journal....Chicago, Ill.	286
WAAM	L. S. Nelson Co.....Newark, N. J.	263
WAAN	University of Missouri.....Columbia, Mo.	254
WAAW	Omaha Grain Exchange.....Omaha, Nebr.	286
WABB	Harrisburg Sporting Goods Co...Harrisburg, Pa.	266
WABD	Parker High School.....Dayton, Ohio	283
WABE	Young Men's Christian Assn..Washington, D. C.	283
WABH	Lake Shore Tire Co.....Sandusky, Ohio	240
WABI	Bangor Railway & Electric Co.	240
WABK	First Baptist Church.....Worcester, Mass.	252
WABL	Connecticut Agricultural College...Storrs, Conn.	283
WABM	F. E. Doherty Automotive & Radio Equipment Co., Saginaw, Mich.	254
WABN	Ott Radio Co.....La Crosse, Wis.	244
WABO	Lake Avenue Baptist Church....Rochester, N. Y.	252
WABP	Robert F. Weinig.....Dover, Ohio	266
WABQ	Haverford College Radio Club....Haverford, Pa.	261
WABR	Scott High School.....Toledo, Ohio	270
WABT	Holiday Hall Elec. Co.....Washington, Pa.	252
WABU	Victor Talking Machine Co.....Camden, N. J.	226
WABW	College of Wooster.....Wooster, Ohio	234
WABX	Henry B. Joy.....Mount Clemens, Mich.	270
WABY	John Magaldi, Jr.....Philadelphia, Pa.	242
WABZ	Coliseum Place Baptist Church, New Orleans, La.	263
WBAA	Purdue University .....West Lafayette, Ind.	263
WBAH	The Dayton Co.....Minneapolis, Minn.	417
WBAN	Wireless Phone Corporation.....Paterson, N. J.	244
WBAO	James Milliken University.....Decatur, Ill.	360
WBAP	Wortham-Carter Publishing Co. (Star-Telegram), Fort Worth, Tex.	476
WBAV	Erner & Hopkins Co.....Columbus, Ohio	423
WBAX	John H. Sterger, Jr.....Wilkes-Barre, Pa.	360
WBAY	Western Electric Co.....New York, N. Y.	492
WBBD	Barbour Battery Service.....Reading, Pa.	234
WBBG	Irving Vermilya .....Mattapoisett, Mass.	248
WBBH	J. Irving Bell.....Port Huron, Mich.	246
WBBL	Grace Covenant Church.....Richmond, Va.	283
WBBM	Frank Atlass Produce Co.....Lincoln, Ill.	220
WBBN	A. B. Blake.....Wilmington, N. C.	275
WBBP	Petoskey High School.....Petoskey, Mich.	248
WBBR	Peoples Pulpit Association.....Rossville, N. Y.	273
WBBT	Lloyd Brothers .....Philadelphia, Pa.	234
WBBU	Jenks Motor Sales Co.....Monmouth, Ill.	224
WBBV	Johnstown Radio Co.....Johnstown, Pa.	248
WBBW	Ruffner Junior High School.....Norfolk, Va.	272
WBBY	Washington Light Infantry....Charleston, S. C.	280
WBBZ	Noble B. Watson.....Indianapolis, Ind.	227
WBL	T & H Radio Co.....Anthony, Kans.	254
WBS	D. W. May, Inc.....Newark, N. J.	360

WBT	Southern Radio Corporation	Charlotte, N. C. 360
WBZ	Westinghouse Elec. & Mfg. Co.	Springfield, Mass. 337
WCAD	St. Lawrence University	Canton, N. Y. 280
WCAE	Kaufmann & Baer Co.	Pittsburgh, Pa. 462
WCAG	Clyde R. Randall	New Orleans, La. 254
WCAH	Entrekin Electric Co.	Columbus, Ohio 286
WCAJ	Menrasla Wes.eyan University,	University Place, Nebr. 283
WCAK	Alfred P. Daniel	Houston, Tex. 263
WCAL	St. Olaf College	Northfield, Minn. 366
WCAO	Sanders & Stayman Co.	Baltimore, Md. 360
WCAP	Chesapeake & Potomac Telephone Co.,	Washington, D. C. 469
WCAR	Southern Radio Corporation of Texas,	San Antonio, Tex. 360
WCAS	William Hood Dunwoody Industrial Institute,	Minneapolis, Minn. 280
WCAT	South Dakota State School of Mines,	Rapid City, S. Dak. 240
WCAU	Durham & Co.	Philadelphia, Pa. 286
WCAV	J. C. Dice Electric Co.	Little Rock, Ark. 360
WCAX	University of Vermont	Burlington, Vt. 360
WCAY	Milwaukee Civic Broadcasting Station,	Milwaukee Wis. 296
WCAZ	Carthage College	Carthage, Ill. 246
WCBA	Charles W. Heimbach	Allentown, Pa. 280
WCBC	University of Michigan	Ann Arbor, Mich. 280
WCBD	Wilbur G. Voliva	Zion, Ill. 345
WCBE	Uhalt Radio Co.	New Orleans, La. 263
WCBF	Paul J. Miller	Pittsburgh, Pa. 236
WCBG	Howard S. Williams	Mayfield, Ky. 268
WCBH	University of Mississippi	Oxford, Miss. 242
WCBI	Nicoll, Duncan & Rush	Bemidji, Tenn. 240
WCBJ	J. C. Mans	Jennings, La. 244
WCBK	E. Richard Hall	St. Petersburg, Fla. 266
WCBL	Northern Radio Mfg. Co.	Houlton, Me. 280
WCBM	Charles Schwarz	Baltimore, Md. 229
WCBN	James P. Boland, Lieut. U. S.	Fort Benjamin Harrison, Ind. 266
WCBO	Radio Shop, Inc.	Memphis, Tenn. 250
WCBQ	First Baptist Church	Nashville, Tenn. 246
WCBR	Charles H. Menster	Providence, R. I. 246
WCBT	Clark University	Worcester, Mass. 238
WCBZ	Arnold Wireless Supply Co.	Arnold, Pa. 254
WCBV	Tullahoma Radio Club	Tullahoma, Tenn. 252
WCBW	George P. Rankin, Jr., and Mitland Soloman.	Macon, Ga. 226
WCBX	Radio Shop of Newark	Newark, N. J. 233
WCBY	Forks Electrical Shop	Buck Hill Falls, Pa. 268
WCBZ	Coppotelli Bros. Music House,	Chicago Heights, Ill. 248
WCCO	Gold Medal Radio Sta., St. Paul and Minneapolis	417
WCK	Stix-Baer & Fuller Dry Goods Co., St. Louis, Mo.	360
WCX	Detroit Free Press	Detroit, Mich. 517
WDAE	Tampa Daily Times	Tampa, Fla. 360
WDAF	Kansas City Star	Kansas City, Mo. 411
WDAG	J. Laurance Martin	Amarillo, Tex. 263
WDAH	Trinity Methodist Church (South), El Paso, Tex.	268
WDAR	Lit Brothers	Philadelphia, Pa. 395
WDAS	Sam Waite's Radio Shop	Worcester, Mass. 360
WDAU	Slocum & Kilburn	New Bedford, Mass. 360
WDAY	Radio Equipment Corporation,	Fargo, N. Dak. 244
WDBB	A. H. Waite & Co.	Taunton, Mass. 229
WDBC	Kirk, Johnson & Co.	Lancaster, Pa. 258
WDBD	Herman E. Burns	Marlinsburg W. Va. 268
WDBF	Robert G. Phillips	Youngstown, Ohio 246
WDBH	C. T. Sherer Co.	Worcester, Mass. 268
WDBI	Radio Specialty Co.	St. Petersburg, Fla. 226
WDBJ	Richardson-Wayland Elec'l Corp.,	Roanoke, Va. 229
WDBK	M. F. Broz Furniture, Hardware & Radio Co.,	Cleveland, Ohio 248
WDBN	Maine Electric Light & Power Co.,	Bangor, Me. 252
WDBO	Rollins College	Winter Park, Fla. 240
WDBP	Superior State Normal School	Superior, Wis. 261
WDBQ	Morton Radio Supply Co.	Salem, N. J. 234
WDBQ	Tremont Temple Baptist Church	Boston, Mass. 256
WDBS	S. R. Taylor Radio Corp.	Dayton, Ohio 283
WDBT	Taylor's Book Store	Hattiesburg, Miss. 236
WDBU	Somerset Radio Co.	Skowhegan, Me. 258
WDBV	Strand Theater	Fort Wayne, Ind. 258
WDBW	The Radio Den	Columbia, Tenn. 268
WDBX	Otto Baur	New York, N. Y. 233
WDBY	North Shore Congregational Church	Chicago, Ill. 258
WDBZ	Boy Scouts of America (Ulster County Council),	Kingston, N. Y. 233
WDM	Church of the Covenant	Washington, D. C. 234
WDZ	James L. Bush	Tuscola, Ill. 278
WEAA	Frank D. Fallain	Flint, Mich. 280
WEAF	American Tel. & Tel. Co.	New York, N. Y. 492
WEAH	Wichita Board of Trade	Wichita, Kans. 280
WEAI	Cornell University	Ithaca, N. Y. 286
WEAJ	University of South Dakota	Vermillion, S. Dak. 283
WEAM	Borough of North Plainfield,	North Plainfield, N. J. 286
WEAN	Shepard Co.	Providence, R. I. 273
WEAO	Ohio State University	Columbus, Ohio 360
WEAP	Mobile Radio Co.	Mobile, Ala. 360
WEAR	Evening News Publishing Co.	Baltimore, Md. 261
WEAU	Davidson Bros. Co.	Sioux City, Iowa 275
WEAY	Iris Theater	Houston, Tex. 360
WEB	Benwood Co.	St. Louis, Mo. 273
WEBA	The Electric Shop	Highland Park, N. J. 233
WEBC	Walter C. Bridges	Superior, Wis. 242
WEBD	Electrical Equipment & Service Co.,	Anderson, Ind. 246
WEBH	Edgewater Beach Hotel Co.	Chicago, Ill. 370
WEBJ	Third Avenue Railway	N. Y. City, N. Y. 360
WEBK	Grand Rapids Radio Co.	Grand Rapids, Mich. 360
WEBL	R. W. Fahrlander	Hamilton, O. 280
WEBP	Spanish Fort Amusement Park,	New Orleans, La. 280
WEBQ	Tate Radio Co.	Harrisburg, Ill.
WEBR	Howell Electrical Co.	Buffalo, N. Y.
WEBT	Dayton Cooperative School	Dayton, O.
WEBU	DeLand Music Company	DeLand, Fla.
WEBW	Beloit College	Beloit Wis.
WEEI	Edison Elec. Co.	Boston, Mass.
WEV	Hurlburt-Still Electrical Co.	Houston, Tex. 263
WEW	St. Louis University	St. Louis, Mo. 280
WFAA	Dallas News and Dallas Journal	Dallas, Tex. 476
WFAB	P. M. Woese	Syracuse, N. Y. 234
WFAM	Times Publishing Co.	St. Cloud, Minn. 273
WFAN	Hutchinson Electric Service Co.,	Hutchinson, Minn. 286
WFAV	University of Nebraska	Lincoln, Nebr. 275
WFBH	Concourse Radio Corp.	N. Y. City, N. Y.
WFBI	Gaivin Radio Supply Co.	Camden, N. J. 236
WFBJ	St. Johns University	Collegeville, Minn.
WFI	Strawbridge & Clothier	Philadelphia, Pa. 395
WGAL	Lancaster Electric Supply & Construction Co.,	Lancaster, Pa. 248
WGAN	Cecil E. Lloyd	Pensacola, Fla. 360
WGAQ	Yauree Hotel	Shreveport, La. 252
WGAZ	South Bend Tribune	South Bend, Ind. 275
WGI	American Radio & Research Corp.,	Medford Hillside, Mass. 360
WGL	Thomas F. J. Howlett	Philadelphia, Pa. 360
WGN	Tribune	Chicago, Ill. 370
WGR	Federal Tel. & Tel. Co.	Buffalo, N. Y. 319
WGY	General Electric Co.	Schenectady, N. Y. 380
WHA	University of Wisconsin	Madison, Wis. 360
WHAA	State University of Iowa	Iowa City, Iowa 484
WHAD	Marquette University	Milwaukee, Wis. 280
WHAG	University of Cincinnati	Cincinnati, Ohio 222
WHAH	Hafer Supply Co.	Joplin, Mo. 283
WHAK	Roberts Hardware Co.	Clarksburg, W. Va. 258
WHAM	University of Rochester	Rochester, N. Y. 283
WHAR	Seaside Hotel	Atlantic City, N. J. 275
WHAS	Courier-Journal and Louisville Times,	Louisville, Ky. 400
WHAV	Wilmington Electrical Specialty Co.,	Wilmington, Del. 60
WHAZ	Rennselaer Polytechnic Institute,	Troy, N. Y. 380
WHB	Sweeney School Co.	Kansas City, Mo. 411
WHK	Radiovox Co.	Cleveland, Ohio 283
WHN	George Schubel	New York, N. Y. 360
WHO	Bankers Life Co.	Des Moines, Iowa 526
WIAB	Art. A. Johnson Garage	Rockford, Ill. 252
WIAC	Galveston Tribune	Galveston, Tex. 360
WIAD	Howard R. Miller	Philadelphia, Pa. 254
WIAK	Journal-Stockman Co.	Omaha, Nebr. 278
WIAQ	Chronicle Publishing Co.	Marion, Ind. 226
WIAS	Home Electric Co.	Burlington, Iowa 283
WIK	K. & L. Electric Co.	McKeesport, Pa. 234
WIL	Continental Electrical Supply Co.,	Washington, D. C. 360
WIP	Gimbel Brothers	Philadelphia, Pa. 509
WJAB	American Electric Co.	Lincoln, Nebr. 229
WJAD	Jackson's Radio Engineering Laboratories,	Waco, Tex. 360
WJAG	Norfolk Daily News	Norfolk, Nebr. 283
WJAK	Clifford L. Wnite	Greentown, Ind. 254
WJAM	D. M. Perham	Cedar Rapids, Iowa 268
WJAN	Peoria Star	Peoria, Ill. 280
WJAR	The Outlet Co.	Providence, R. I. 360
WJAS	Pittsburgh Radio Supply House,	Pittsburgh, Pa. 286
WJAX	Union Trust Co.	Cleveland, Ohio 390
WJAZ	Chicago Radio Laboratory	Chicago, Ill. 268
WJD	Denison University	Granville, Ohio 360
WJY	R. C. A.	New York, N. Y. 405
WJZ	R. C. A.	New York, N. Y. 455
WKAA	H. F. Paar	Cedar Rapids, Iowa 278
WKAD	Charles Looff (Crescent Park),	East Providence, R. I. 240
WKAF	W. S. Radio Supply Co.	Wichita Falls, Tex. 360
WKAN	United Battery Service Co.	Montgomery, Ala. 226
WKAP	Dutee W. Flint	Cranston, R. I. 360
WKAQ	Radio Corp. of Porto Rico	San Juan, P. R. 360
WKAR	Michigan Agricultural College,	E. Lansing Mich. 280
WKAV	Laconia Radio Club	Laconia, N. H. 254
WKBF	Dutee W. Flint	Cranston, R. I. 286
WKY	WKY Radio Shop	Oklahoma, Okla. 360
WLAH	Samuel Woodworth	Syracuse, N. Y. 234
WLAL	Naylor Electrical Co.	Tulsa, Okla. 360
WLAP	W. V. Jordon	Louisville, Ky. 286
WLAQ	Arthur E. Schilling	Kalamazoo, Mich. 283
WLAX	Putnam Electric Co. (Greencastle community broadcasting station),	Greencastle, Ind. 231
WLB	University of Minnesota	Minneapolis, Minn. 360
WLBL	Wisconsin Department of Markets,	Stevens Point, Wis. 278
WLS	Sears, Roebuck & Co.	Chicago, Ill. 345
WLW	Crosley Radio Corp.	Cincinnati, Ohio 423
WMAC	Clive B. Meredith	Cazenovia, N. Y. 261
WMAF	Round Hills Radio Corp.	Dartmouth, Mass. 360
WMAH	General Supply Co.	Lincoln, Nebr. 293
WMAK	Norton Laboratories	Lockport, N. Y. 273
WMAL	Trenton Hardware Co.	Trenton, N. J. 256
WMAN	Heskett Radio Station	Columbus, Ohio 286
WMAQ	Chicago Daily News	Chicago, Ill. 448
WMAV	Alabama Polytechnic Institute	Auburn, Ala. 250
WMAY	Kingshinway Presby. Church	St. Louis, Mo. 280
WMAZ	Mercer University	Macon, Ga. 261
WMC	"Commercial Appeal"	Memphis, Tenn. 500
WMH	Ainsworth-Gates Radio Co.	Cincinnati, Ohio 309
WMU	Doubleday-Hill Electric Co.	Washington, D. C. 261
WNAC	Shepard Stores	Boston, Mass. 278
WNAD	University of Oklahoma	Norman, Okla. 360
WNAP	Wittenberg College	Springfield, Ohio 360
WNAR	First Christian Church	Butler, Mo. 231
WNAT	Lenning Brothers	Philadelphia, Pa. 360
WNAW	Henry Kunzmann	Fort Monroe, Va. 360
WNAX	Dakota Radio Apparatus Co.	Yankton, S. Dak. 244
WOAC	Page Organ Co.	Lima, Ohio 266
WOAE	Midland College	Fremont, Nebr. 280
WOAF	Tyler Commercial College	Tyler, Tex. 360
WOAG	Apollo Theater	Providence, R. I. 360
WOAI	Southern Equipment Co.	San Antonio, Tex. 385
WOAJ	Ervins Electrical Co.	Parsons, Kans. 258
WOAN	James D. Vaughn	Lawrenceburg, Tenn. 360
WOAO	Lyradion Mfg. Co.	Mishawaka, Ind. 360
WOAT	Boyd M. Hamp	Wilmington, Del. 360
WOAV	Pennsylvania National Guard, 112th Infantry,	Erie, Pa. 242
WOAW	Woodmen of the World	Omaha, Nebr. 526
WOAX	Franklyn J. Wolff	Trenton, N. J. 240
WOC	Palmer School of Chiropractic	Davenport, Iowa 484
WOI	Iowa State College	Ames, Iowa 360
WOO	John Wanamaker	Philadelphia, Pa. 509
WOQ	Western Radio Co.	Kansas City, Mo. 360
WOR	L. Bamberger & Co.	Newark, N. J. 405
WOS	Missouri State Marketing Bureau,	Jefferson City, Mo. 441
WPAB	Pennsylvania State College	State College, Pa. 283
WPAC	Donaldson Radio Co.	Okmulgee, Okla. 360
WPAJ	Doolittle Radio Corp.	New Haven, Conn. 268
WPAK	North Dakota Agricultural College,	Agricultural College, N. Dak. 283
WPAL	Avery & Loeb Electric Co.	Columbus, Ohio 286
WPAM	Auerbach & Guettel	Topeka, Kans. 275
WPAR	Ward Battery & Radio Co.	Beloit, Kans. 236
WPAU	Concordia College	Moorehead, Minn. 286
WPAZ	John R. Koch (Dr.)	Charleston, W. Va. 273
WQAA	Horace A. Beale, Jr.	Parkersburg, W. Va. 360
WQAC	Gish Radio Service	Amarillo, Tex. 234
WQAE	Moore Radio News Station	Springfield, Vt. 275
WQAF	Sandusky Register	Sandusky, Ohio 240
WQAM	Electrical Equipment Co.	Miami, Fla. 283
WQAN	Scranton Times	Scranton, Pa. 280
WQAO	Calvary Baptist Church	New York, N. Y. 360
WQAQ	West Texas Radio Co. (Abilene Daily Reporter),	Abilene, Tex. 360
WQAS	Prince-Walter Co.	Lowell, Mass. 266
WQAX	Radio Equipment Co.	Peoria, Ill. 248
WQJ	Calumet Rainbow Broadcasting Co.	Chicago, Ill. 448
WRAF	The Radio Club	Laporte, Ind. 240
WRAL	Northern States Power Co.	St. Croix Falls, Wis. 248
WRAM	Lombard College	Galesburg, Ill. 244
WRAN	Black Hawk Electrical Co.	Waterloo, Iowa 236
WRAO	St. Louis Radio Service Co.	St. Louis, Mo. 360
WRAV	Antioch College	Yellow Springs, Ohio 242
WRAW	Reading Radio Shop	Reading, Pa. 238
WRAX	Flexon's Garage	Gloucester City, N. J. 268
WRBC	Immanuel Lutheran Church	Valparaiso, Ind. 278
WRC	Radio Corp. of America	Washington, D. C. 469
WRK	Doron Bros. Electrical Co.	Hamilton, Ohio 360
WRL	Union College	Schenectady, N. Y. 360
WRM	University of Illinois	Urbana, Ill. 360
WRR	City of Dallas, Police and Fire Signal Department,	Dallas, Tex. 360
WRW	Tarrytown Radio Research Laboratory,	Tarrytown, N. Y. 273
WSAB	Southeast Missouri State Teachers College,	Cape Girardeau, Mo. 360
WSAC	Clemson Agricultural Col.,	Clemson College, S. C. 360
WSAD	J. A. Foster Co.	Providence, R. I. 261
WSAI	United States Playing Card Co.	Cincinnati, Ohio 309
WSAJ	Grove City College	Grove City, Pa. 258
WSAP	Seventh Day Adventist Church,	New York, N. Y. 360
WSAR	Doughty & Welch Electrical Co.,	Fall River, Mass. 224
WSAU	Camp Marienfeld	Chesham, N. H. 333
WSAV	Clifford W. Vick Radio Construction Co.,	Houston, Tex. 360
WSAY	Irving Austin (Port Chester Chamber of Commerce),	Port Chester, N. Y. 233
WSAZ	Chase Electric Shop	Pomeroy, Ohio 250
WSB	Atlanta Journal	Atlanta, Ga. 429
WSC	Radio Corp. of America	Tuckerton, N. J.
WSL	J. & M. Electric Co.	Utica, N. Y. 275
WSOE	School of Engineering of Milwaukee,	Milwaukee, Wis. 246
WSY	Alabama Power Co.	Birmingham, Ala. 360
WTAB	Fall River Daily Herald Publishing Co.,	Fall River, Mass. 224
WTAC	Penn. Traffic Co.	Johnstown, Pa. 275
WTAF	Louis J. Gallo	New Orleans, La. 360
WTAJ	The Radio Shop	Portland, Me. 238
WTAL	Toledo Radio & Electric Co.	Toledo, Ohio 232
WTAM	Willard Storage Battery Co.	Cleveland, Ohio 390
WTAP	Cambridge Radio & Electric Co.	Cambridge, Ill. 360
WTAQ	S. H. Van Gorden & Son	Osseo, Wis. 254
WTAR	Reliance Electric Co.	Norfolk, Va. 360
WTAS	Charles E. Erbstein	Elgin, Ill. 286
WTAT	Edison Electric Illuminating Co.	Boston, Mass. 344
WTAU	Ruegg Battery & Electric Co.	Tecumseh, Nebr. 248
WTAW	Agricultural & Mechanical College of Texas,	College Station, Tex. 280
WTAX	Williams Hardware Co.	Streator, Ill. 231
WTAY	Oak Leaves Broadcasting Station,	Oak Park, Ill. 293
WTAZ	Thomas J. McGuire	Lambertville, N. J. 233
WTG	Kansas State Agricultural College,	Manhattan, Kans. 273
WTL	H. G. Saal Co.	Chicago, Ill. 360
WWAD	Wright & Wright, Inc.	Philadelphia, Pa. 360
WWAO	Michigan College of Mines	Houghton, Mich.
WWI	Ford Motor Co.	Dearborn, Mich. 273
WWJ	Detroit News	Detroit, Mich. 517
WWL	Loyola University	New Orleans, La. 360

Canadian Stations

CKLC	Wilkinson Electric Co., Ltd.	Calgary, Alta. 400
CJCD	T. Eaton Co., Ltd.	Toronto, Ont. 400
CFCU	Jack V. Elliot, Ltd.	Hamilton, Ont. 400
CFLC	Chas. Guy Hunter	London, Ont. 400
CHCS	The Hamilton Spectator	Hamilton, Ont. 400
CHYC	Northern Electric Co., Ltd.	Montreal, P. Q. 341
CFCF	Marconi W. T. Co. of Can., Ltd.	Montreal, P. Q. 440
CKCO	Dr. G. M. Geiderd	Ottawa, Ont. 400
CHNC	Toronto Radio Research Society	Toronto, Ont. 356
CKCH	Canadian National Railways	Ottawa, Ont. 478
CJCM	J. L. Philippe Landry	Mont Joli, P. Q. 312
CHXC	J. R. Booth, Jr.	Ottawa, Ont. 435
CHCE	Western Canada Radio Supply,	Victoria, B. C. 400
CKY	Manitoba Telephone System	Winnipeg, Man. 400
CKCD	Vancouver Daily Province	Vancouver, B. C. 400
CFCA	Star Publishing & Printing Co.,	Toronto, Ont. 400
CFAC	The Calgary Herald	Calgary, Alta. 436
CKAC	La Presse Publishing Co., Ltd.,	Montreal, P. Q. 430
CFCH	Abitibi Power & Paper Co., Ltd.,	Iroquois Falls, Ont. 400
CJCF	The News Record	Kitchener, Ont. 400
CJGC	London Free Press Printing Co., Ltd.,	London, Ont. 400
CFRF	Queen's University	Kingston, Ont. 400
CFCQ	Radio Specialties, Ltd.	Vancouver, B. C. 400
CFCD	Sparks Company	Nanaimo, B. C. 400
CJCA	The Edmonton Journal, Ltd.	Edmonton, Alta. 400
CFCK	Radio Supply Co., Ltd.	Edmonton, Alta. 400
CJCE	Sprott Shaw Radio Co.	Vancouver, B. C. 400
CFCL	Centennial Methodist Church	Victoria, B. C. 400
CJSC	The Evening Telegram	Toronto, Ont. 400
CFYC	Victor Wentworth Odium	Vancouver, B. C. 400
CFXC	Westminster Trust Co.	New Westminster, B. C. 400
CKCI	Le "Soliel" Limitee	Quebec, P. Q. 250
CFQC	The Electric Shop, Ltd.	Saskatoon, Sask. 400
CHBC	The Albertan Publishing Co.	Calgary, Alta. 400

British Stations

2LO	London	365
5IT	Birmingham	479
5WA	Cardiff	353
6BM	Bournemouth	385
2ZY	Manchester	375
5NO	Newcastle	400
5SC	Glasgow	420
2BD	Aberdeen	495
6SL	Sheffield (relay station)	306

French Stations

YN	Lyon	740
FL	Paris (Eiffel Tower)	2,650
ESP	Paris	450
SAJ	Paris	1,780

Cuban Stations

PWX	Cuban Telephone Co.	Habana 400
2DW	Pedro Zayas	Habana 360
2AB	Alberto S. de Bustamante	Habana 240
2OK	Mario Garcia Vélez	Habana 360
2BY	Frederick W. Borton	Habana 360
2CX	Frederick K. Borton	Habana 360
2EV	Westinghouse Elec. Co.	Habana 360
2TW	Roberto E. Ramirez	Habana 360
2HC	Heraldo de Cuba	Habana 370
2LC	Luis Casas	Habana 240
2KD	E. Sanchez de Fuentes	Habana 360
2MN	Fausto Simon	Habana 270
2MG	Manuel G. Salas	Habana 360
2JQ	Raul Pérez Falcon	Habana 360
2KP	Alvaro Daza	Habana 360
2HS	Julio Power	Habana 360
2OL	Oscar Collado	Habana 240
2WW	Amadeo Saenz	Habana 240
5EV	Leopold V. Figueroa	Colon 360
6KW	Frank H. Jones	Tuinucu 360
6KJ	Frank H. Jones	Tuinucu 275
5EV	Leopoldo V. Figueroa	Colon 360
6DW	Eduardo Terry	Cienfuegos 235
6BY	José Ganduxe	Cienfuegos 360
6AZ	Valentin Ulivarri	Cienfuegos 360
6EV	Josefa Alvarez	Caibarién 225
7AZ	Pedro Nogueras	Camaguey 360
7BY	Salvador Dionda	Camaguey 360
3AZ	Alfredo Broocks	Santiago de Cuba 360
8BY	Alberto Ravelo	Santiago de Cuba 360
8FU	Andrés Vinnet	Santiago de Cuba 275
8DW	Pedro C. Anduz	Santiago de Cuba 360
8EV	Eduardo Mateos	Santiago de Cuba 360
8GT	Juan F. Chibas	Santiago de Cuba 360

Eveready Heavy Duty "B" Battery, 45 volts. Three Fahnestock clips. Length, 8 3/16 inches; width, 4 7/16 inches; height, 7 3/16 inches; weight, 13 3/4 pounds. Price $4.75.

No 770
EVEREADY
RADIO
"B" BATTERY
30 CELLS 45 VOLTS
This heavy duty 45 volt "B" battery is especially designed to give longer service under heavy drain and is particularly adapted for use with multi-tube sets, operating at 90 volts or more.
NATIONAL CARBON CO. Inc.
NEW YORK SAN FRANCISCO
MADE IN U.S.A.
EVEREADY

Dry "B" Batteries are more economical and more dependable than any other source of plate current!

REDUCE Operating Costs

THOUSANDS of people are already cutting their "B" Battery costs one-half, or even two-thirds, by using the new Eveready "B" Battery No. 770 on their heavy drain sets.

This new Eveready Heavy Duty Battery marks a marvelous advance in reducing "B" Battery costs.

If your "B" Batteries have lasted only two months on a five or six tube receiver, this Eveready Heavy Duty "B" Battery will increase the service two to three times.

Use this Eveready Heavy Duty "B" Battery on any receiving set on which the "B" Batteries last less than four months. When thus used to its full capacity, it is the cheapest as well as the best source of "B" energy ever offered.

Manufactured and guaranteed by
NATIONAL CARBON COMPANY, INC.
Headquarters for Radio Battery Information
New York San Francisco
Canadian National Carbon Co., Limited, Toronto, Ontario

EVEREADY
Radio Batteries
—they last longer

The MOZART Baby GRAND
Radio Reproducer

A Perfect Radio Xmas Gift

You, of course, desire to give the best you can afford and if any Mozart product comes within your price limit, you will always have the satisfaction of knowing you gave the best. You will enter into a little of what we enjoy from day to day, as we continue to receive entirely unsolicited appreciations like the following:

"Baby Grand received, and, saying that I was surprised is putting it very mild. Due to low B battery voltage, a $25.00 speaker would not work, so hooked up the Mozart on a one tube Auto-Plex, and secured KDKA, WBZ, WGY and several others with volume enough to fill the room. I then hooked it up to a two tube Crosley, securing more volume with very satisfactory results.

"This is not a fair trial, as none of the B batteries registered over 16 volts, and to be exact, they were as follows: 16-16-15-14. Will say the tone was exceptional, very little distortion, if any, volume wonderful, and, will simply say that none of your claims are exaggerated, but are very modest and conservative.

"You have a product worthy of consideration, and the best all round speaker I have tried out and I feel you are due this letter of appreciation, which you may use as the quality of your product deserves it.

(Signed) R. S. TILDEN
(Atlantic Coast Line Railway Co.) Maysville, No. Car."

PRICES

Reproducer, Complete.	**(No extra batteries required.)**
Model A, approx. 12" bell, black and gold crocodile finish, gold plated unit	**$12.00**
Model B, approx. 12" bell, heavily coated all black satin finish, gold plated	**12.00**
Model C, approx. 11" bell, black satin finish, nickel plated unit	**10.00**
Electro-Magnetic unit, with cord, nickel plated (fits almost any horn or phonograph)	**4.00**
As above, gold plated	**5.00**
Mozart Special Headset	**6.00**

Orders. If your dealer cannot supply, order direct.

Transportation. Single shipments, strictly F.O.B., factory. Free on two or more orders for each item.
C.W.O. or C.O.D. when order accompanied by small deposit.

Guarantee. One year from date of purchase or money back in ten days.

THE MOZART GRAND CO.
Manufacturers of Fine Instruments
NEWARK, NEW JERSEY U. S. A.

Filament Circuits

(Continued from page 52)

resistance should equal 8 ohms. As the tubes already offer 6.66 ohms, the rheostat R should have a resistance of about 1.33 ohms.

Another and more common method of finding the value of R for the conditions outlined above, is to say that since the proper voltage across the filaments is 5 and the battery voltage 6, then the voltage across the resistance R must be 1. Assuming this to be true and that the current through the circuit is three-quarters ampere, then the resistance value of R will equal the voltage divided by the current, or $1 \div \frac{3}{4}$ which equals 1.33 ohms, the value of R.

A list of the proper values of fixed resistances for use with different tubes on different voltages is given here. The values are not exact but they will serve as further examples of the rules.

Tube	Batt. Voltage (Representing 1, 2 and 3 storage cells and 1, 2, 3, and 4 dry cells.)	Resistance	Current
UV-201A	6.0	6.0	.23
UV-201A	4.5	0.	.22
UV-201A	4.0	0.	.20
WD-12 or 11	1.5	2.0	.23
WD-12 or 11	2.0	4.1	.23
UV-199	3.0	0.	.06
UV-199	4.0	18.0	.06
UV-199	4.5	30.0	.06
UV-199	6.0	55.0	.06
UV-201	6.0	1.5	.92

. In multi-tube filament circuits, remember that only filaments of like voltage requirements can be connected in parallel for regulation with a common rheostat.

An interesting case was brought up some time ago by a man who had a five-tube receiver with separate 30-ohm rheostats. He wished to use UV-199s and a 6-volt battery, and he wanted to know what size resistance he should use in series with the battery to keep the current at the proper value.

One way of arriving at the solution is as follows: He had a 6-volt battery and five parallel circuits each consisting of a UV-199 filament and a 30-ohm rheostat as shown in (D) figure 1. The resistance of each UV-199 filament—computed from the proper filament terminal voltage of 3 and the resultant current of .06 ampere—is 50 ohms, so each circuit has a resistance of 80 ohms, when the rheostats are set at maximum. Five such circuits in parallel have an effective resistance of $80 \div 5$ or 16 ohms. The total current through the entire five circuits is .3 ampere—the current through one circuit, .06 ampere multiplied by 5.

What resistance is required to restrict the current from a 6-volt bat-

(Turn to page 58)

Model S
Audiophone, $25
Rubber Horn 14½" diameter. Velvet mat finish of mottled bronze and gold; classic base.

Both Must Be Musical Instruments

If you are to enjoy the rich resonance of an old Cremona violin, your loud speaker must also be a true *musical* instrument. So designed and powered as to respond as faithfully to the inspiring crescendos of a Wagner opera as to the whispers of a Moonlight Sonata.

The new Bristol AUDIOPHONE does that. With its joyous, open-throated rubber horn, and its finely adjusted tone mechanism, it is on a musical plane with the noblest instrument or voice at your favorite station.

In addition to Model S, shown here, the Bristol line includes Model J, $20; Baby Grand, $15, and the "Baby" at $12.50. Send for Bulletin 3011 and 3017-V, mentioning name of your dealer.

THE BRISTOL COMPANY
WATERBURY, CONN.

BRISTOL AUDIOPHONE

TRADE MARK REG. U. S. PAT. OFFICE

LOUD SPEAKER

B-T Lifetime Condenser Type	Plates	M.M.F.	Price
7-L	7	125	$4.25
11-L	13	250	$4.50
23-L	23	500	$5.00
35-L	35	750	$6.50

FILTER YOUR RADIO PROGRAMS

with a

B-T LIFETIME CONDENSER

You wouldn't drink impure water! Then why be satisfied with a jumble of stations when a B-T Lifetime Condenser will filter your reception and give you—

GREATER SELECTIVITY
LONGER DISTANCE
STRONGER SIGNALS
EASIER TUNING

The B-T plate shape spaces the stations uniformly over the dials instead of bunching them at the lower end. Each wave length has its own particular channel.

Plate alignment is not disturbed when you adjust for wear or friction—the B-T 2-step, thrust type, lubricated bearing takes care of that.

Losses are too low to be measured. The appearance is attractive—the workmanship beautiful. No wonder everyone says, "Good for a Lifetime."

The same simplicity and efficiency characterizes the B-T Low Loss Tuner. Both types have the improved B-T windings, skeleton frame and adjustable untuned primary that insure low losses and unusual selectivity.

Place your order for these B-T parts with your dealer today and get the best out of your set.

B-T Low Loss Tuners (Ranges covered with a type 11-L Lifetime Condenser.)
Type B 200 to 565..$5.00
Type SW 50 to 150..$5.00

The 6th edition of "Better Tuning," a profusely illustrated booklet of hook-ups, construction and general information is now ready. Send 10 cents for a postpaid copy. If it isn't worth more we'll return your money.

BREMER-TULLY MFG. CO.

"Pioneers of Better Tuning"

532 S. CANAL ST. CHICAGO, ILL.

6, 30 or 30 ohms
$1.75

In Canada—Carter Radio Co., Ltd.,—Toronto.

CARTER

New Vernier Control Rheostat

No trick adjustments. CARTER original vernier control gives vernier throughout the entire resistance with but one operation and one knob.

Smooth in operation. No jerking or scraping. No noise—or lost motion. Pigtail connection. Wide spaced solder terminals with binding post connection. Mounts like jack. Knob and pointer one.

Any dealer can supply. Insist on the original.

Carter Radio Co.
1802 REPUBLIC BUILDING
CHICAGO

Filament Circuits

(*Continued from page 56*)

tery to .3 ampere? The voltage (6) divided by the current (.3) equals 20 ohms. The five parallel circuits already offer 16 ohms so the rheostat R should be 20-16 or 4 ohms.

If all the rheostats were cut out, the resistance of each circuit would be 50 ohms and of the five in parallel, 50 ÷ 5 or 10 ohms. Then R would have to be 20-10 or 10 ohms.

This finishes the section on filament circuits; the information given above will enable us to consider potentiometer action and grid biasing!

The next article by John R. Meagher deals with Potentiometers and their relation to Filament Circuits. It will be well to preserve Filament Circuits until you receive your next—the January Issue of THE WIRELESS AGE

Information Desk

Mr. J. H. Burk, an enthusiastic reader of THE WIRELESS AGE, built for himself a D-Coil receiver after the description in the June and October issues. The following telegram is self-explanatory:

FA 548 17 Collect Nite
Oakland California 22
1924 Oct 22 PM 5:45
J H Burk
5610 Seventh Avenue Brooklyn N Y

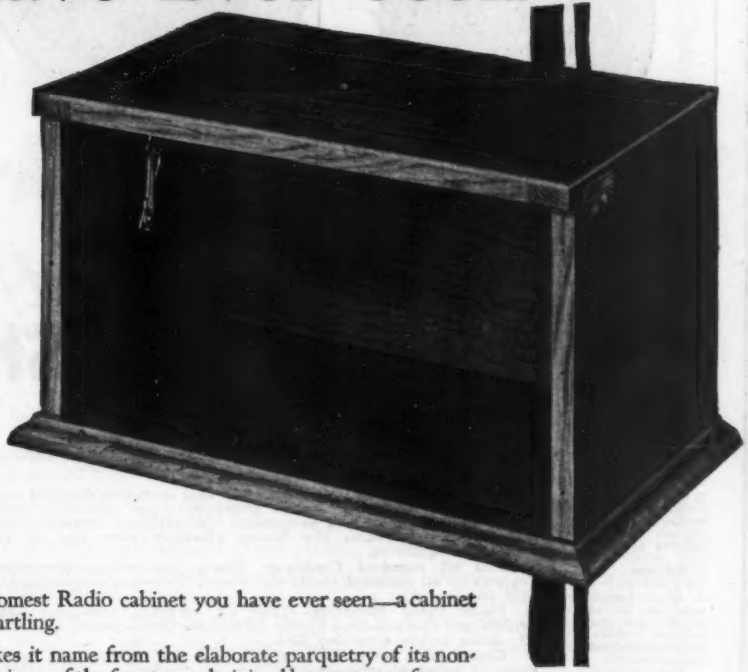
Glad to confirm your reception of Hotel St Frances dance orchestra playing in garden room October twentieth KGO

Didn't we tell you that it was a good set? Brooklyn to Oakland, 3,000 miles! Mr. Burk reports dancing to KGO's orchestra for two hours steadily.

J. L. Menton—Will you explain to a small group of puzzled B.C.L.'s the effect and operation of the grid leak and grid condenser in a detector tube circuit?

In order to explain simply how the grid condenser and leak perform in a detector circuit it is first necessary to know the action of the grid in the tube. By varying the potential applied to the grid of the tube a homologous variation in plate current results. That is—the flow of electrons from filament to plate and the consequent flow of current from plate to filament is either increased or decreased, hampered or helped by the polarity of the charge on the grid. As the grid becomes positive the plate to filament current increases and as the grid becomes negative the plate-to-filament current is reduced. This action is similar to the old pump handle. There is a portion of a tube's characteristic curve at which that tube functions best. To keep the tubes working at this point in an audio frequency amplifier, negative C-batteries are used. To keep the detector tube at this same state, a condenser is used. The grid derives its polarity from the A-battery when no condenser nor C-battery is used. If the return lead from the grid is brought to the positive A-battery then a positive charge accumulates on the plates of the condenser toward the

The Handsomest Cabinet You Have Ever Seen



JEWETT Quality Products

HERE is the handsomest Radio cabinet you have ever seen—a cabinet so different it's startling.

The Jewett Parkay takes it name from the elaborate parquetry of its non-warping top—selected pieces of the finest woods, joined by master craftsmen. Other details are in keeping.

Built of the finest walnut, or mahogany—full equipment of nickeled hardware including continuous piano hinge, top prop, and snap locks—finish that emphasizes the fine woods and armors against surface scratches.

With a Parkay you can build a set that simply can't be excelled in appearance—a set which will command a far higher price than anything housed in the ordinary "wood-butcher's delight" type of cabinet.

"Parkay" your next set! Cost will be about the same. But how you will enjoy the difference!

List Prices

7x7x14	$ 8.25
7x7x18	8.73
7x7x21	9.25
7x7x24	9.74
7x7x26	10.25
7x9x27	10.75
8x8x40 (*With False Bottom*)	19.25

All sizes 21 inches and over, fitted with top rail.

If your dealer cannot supply you, we will ship direct to you, charges prepaid, on receipt of list price.

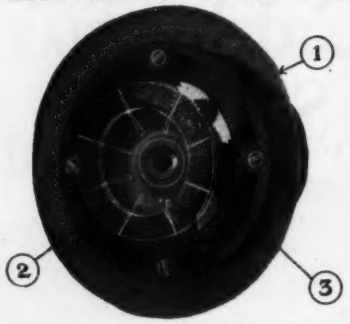
JEWETT RADIO & PHONOGRAPH CO.
5678 12th Street Detroit, Mich.

Parkay

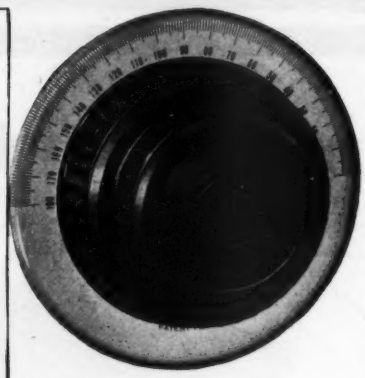
RADIO CABINET

"Quality Goods for Quality Readers"

ACCURATUNE
MICROMETER CONTROLS



for close tuning



Geared 80-1 Ratio

Improved
NO BACK LASH

No ordinary standards of tuning efficiency can be applied to the new improved Accuratune Micrometer Control.
Special construction of this new model offers these superior advantages:

1. Beautiful silvered etched metal disks, making a pleasing contrast between bakelite panel and dial, with finer graduations for finer tuning.
2. A new principle takes up all lost motion and back lash and produces a very smooth operating instrument.
3. Friction shoe steadies condenser and dial operation.

Canadian Representative: Radio Ltd., Montreal.

Eliminates all back lash—Gears and gear operation designed upon scientific engineering principles, producing quiet operation, eliminating all lost motion and back lash. The greatest advance in tuning devices. Increases the tuning efficiency over that of any known tuning device.

Fits all standard Condenser Shafts—Accuratune Micrometer Controls fit all standard shafts and mount to always operate parallel with panel.

Flush Panel Mounting—Take all standard condenser shaft lengths and fit flush with panel. Eliminates the necessity of cutting off shafts before mounting dial.

Geared 80-1 Ratio—Permits infinitely close tuning with perfect ease. A practical ratio—not too low or too high.

Accuratune Micrometer Controls log station after station you never tuned in before. Indispensable on all Super-Heterodynes. Price, $3.50. At your dealers, otherwise send purchase price and you will be supplied postpaid.

ACCURATUNE
80-1
MICROMETER CONTROLS
THE MYDAR RADIO CO., 9-A Campbell St., Newark, N. J.

Learn the Code at Home with the Omnigraph

"Just Listen—The Omnigraph will do the teaching"

THE OMNIGRAPH Automatic Transmitter will teach you both the Wireless and Morse Code—right in your own home—quickly, easily and inexpensively. Connected with Buzzer, Buzzer and Phone or Sounder, it will send you unlimited messages, at any speed from 5 to 50 words a minute. **THE OMNIGRAPH** is not an experiment. For more than 15 years it has been sold all over the world with a money back guarantee. **The OMNIGRAPH** is used by several Depts. of the U. S. Govt.—in fact the Dept. of Commerce uses **THE OMNIGRAPH** to test all applicants applying for a radio license. **THE OMNIGRAPH** has been successfully adopted by the leading Universities, Colleges and Radio Schools.
Send for FREE Catalog describing three models.
DO IT TODAY.

THE OMNIGRAPH MFG. CO.
16B Hudson St. New York City

If you own a Radio Phone set and don't know the Code—you are missing most of the fun

"Quality Goods for Quality Readers"

filament and a resultant negative charge accumulates on the grid which is connected to the other plate of the condenser.

From this it will be seen that the charge on the grid would keep getting greater and greater until the tube spilled over or blocked. This is where the grid leak plays its important part. This high resistance—generally about 2,000,000 ohms allows the accumulated charge to leak off as fast as it gathers and keeps the tube in a stable condition—stable if the leak is the proper size. If it is too large or too small and the tube is used as a regenerative detector the tube will go into oscillation with a flop and a hangover.

Mr. H. L. Johns—What size aerial would be best for my location in a large city for distant reception?

This is a hard question to answer as conditions vary so. Probably an indoor aerial consisting of 30 or 40 feet of bell wire strung around the moulding will best serve your purpose. In New York City, in one instance in particular, much better distant reception was had on a wire soldered to the framework of a folding metal bed than was had on a six-wire cage transmitting antenna. Of course the volume on local stations was much greater on the big antenna but with the bed frame KDKA, WGY and WGN had almost the volume of local stations while they were mere whispers on the big antenna.

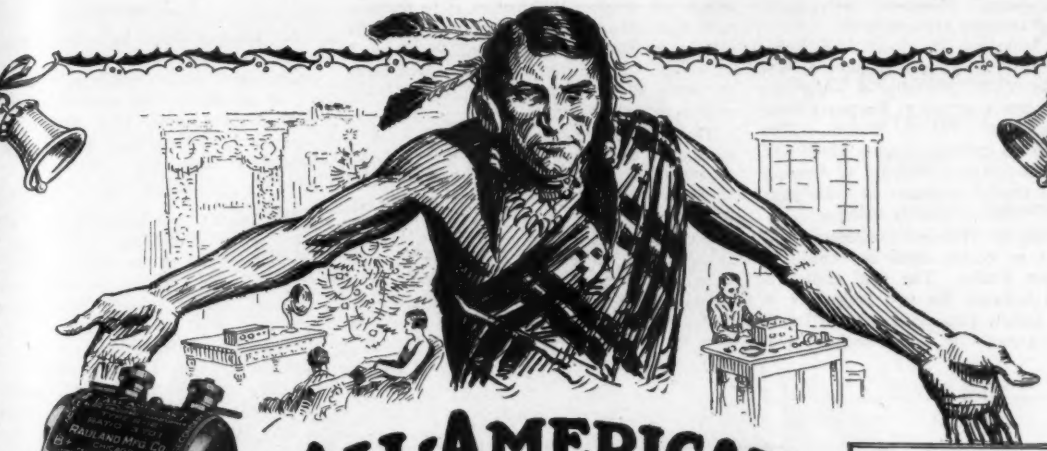
Mr. J. G. Doagle—Is it possible to tune a tuned radio frequency receiver with one knob?

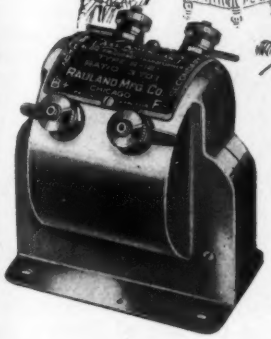
This has been done to some extent, but is not altogether practical. About the nearest one can come to combined tuning is the D-coil receiver shown in the October issue of THE WIRELESS AGE. There the second stage of radio frequency and detector circuit are tuned by one condenser whose rotor plates are divided into two sections. The antenna circuit is tuned by a separate condenser as the antenna tuning varies considerably with different antennae. Tuning more than one circuit with a split condenser requires very careful workmanship on the transformers and connections.

Ilo Literature and Organization

So many thousands of letters have been received in regard to the Auxiliary International Language Ilo that the President of the Radio Auxiliary International Language Society, O. C. Roos, of Beacon Chambers, Boston, Mass., has given up all attempts to answer personally the many letters of inquiry concerning free literature or paid publications in and about Ilo.

Those interested in Ilo should read Dyer's 170-page book, "Problem of the I. L." This is a very impartial and thorough review of the whole problem of an auxiliary language for special purposes. The best Manual on Ilo is by De Beaufront. It contains exercises and a good vocabulary. There is a 30,000-word Ilo-English Lexicon of 408 pages—the most complete ever issued in any





ALL-AMERICAN

Solves Every Gift Problem

If He Has a Radio Set Already —

It can be made a better one by installing genuine ALL-AMERICAN Audio Transformers. Two of these instruments, fitted into any set not already equipped with them, will give the receiver greater loud-speaker volume with remarkable purity of tone. ALL-AMERICAN Transformers are so designed that they amplify fundamentals and harmonics equally, throughout practically the entire audible range. Hence, voice and tones are reproduced *faithfully*

Give him ALL-AMERICANS, the Audio Transformers which, through sheer merit, have become the largest selling transformers in the world. **3 to 1 Ratio, $4.50; 5 to 1 Ratio, $4.75; 10 to 1 Ratio, $4.75.**

If He Needs a High Grade Receiver —

Give him ALL-AMERICAN Super-Fine Parts, and he can build an intermediate-frequency receiver embodying all the most advanced features known in Radio. His set will be the envy of "distance" fans, as well as of his musical friends.

Super-Fine Parts are easily installed. No critical adjustments are necessary. Operation is smooth and flawless. And every part is ALL-AMERICAN—ask any Fan what that means in Radio! Sets built with Super-Fine Parts are unsurpassed for selectivity, range, volume, and tone quality. They represent in a very real sense *the ultimate* in radio broadcast reception.

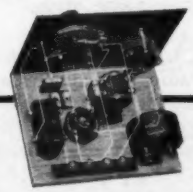
Price, $26.00

ALL-AMAX JUNIOR

An All-American One-Tube Reflex

This is the ideal gift for the youthful beginner in Radio. It comes completely mounted on panel and baseboard, and can be easily wired in one delightful evening with the aid of clear photographs and a 48-page instruction book. Easy to tune—as selective as a multi-tube set—has "crystal" tone quality—volume enough for Speaker operation. It brings in far-distant stations, and *tunes out the locals.*

Price, complete (semi-finished) $22.00



The Radio Key Book

Will help anyone to hear farther and better. Contains practical hints for the set builder—tested hookups—diagrams of All-Amax and other circuits. Sent for 10 cents, coin or stamps

RAULAND MFG. CO.

2674 Coyne St., Chicago

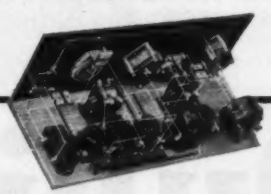
Pioneers in the Industry

ALL-AMAX SENIOR

An All-American Three-Tube Reflex

The set to give if you are looking for a complete receiver of the highest type. Great range and selectivity are provided by three stages of tuned and SELF-TUNED Radio Frequency Amplification. A crystal detector and two stages of Standard ALL-AMERICAN-equipped Audio, insure Speaker volume on distant stations, with undistorted tone quality. Completely assembled—full directions for wiring.

Price, complete (semi-finished) $42.00



ALL-AMERICAN
TRADE MARK

Largest Selling Transformers in the World

"Quality Goods for Quality Readers"

auxiliary language. However, very good elementary grammars are available.

The Old American Ilo Society of Pittsburgh, Pa., is now being reorganized into the North American International Language Society with headquarters at Beacon Chambers, Boston, Mass., for the present. This society will form general classes, which will all adhere to a common program of instruction, without special emphasis on radio matters, and will issue a monthly bulletin.

An International Wireless Conference will shortly meet to decide upon an Auxiliary Language for Radio. The final choice is likely to lie between the two languages in widest use, namely Esperanto and the International Language—Ilo. The decision will affect you because if America is to reciprocate with other countries you must use the chosen language and perforce listen to it in radio. These two synthetic languages so rarely appear side by side that few have ever compared them.

The following paragraph in English is translated into Esperanto and Ilo for your convenience. Compare them by reading them aloud—they are pronounced substantially as written—

We admire well cultivated fields, beautiful and neat villages and towns, picturesque valleys, forests, chasms or mountains with eternally white summits. Also all those who like travel, sport or amusement, find the best opportunities in Switzerland.

ESPERANTO

Ni admiras bone kulturitajn kamparojn, belajn kaj purajn vilaghojn kaj urbojn, pentrindajn valojn, arbarojn, intermontajhojn, au montegojn kun eterne blankaj suproj. Ankau chiuj tiuj, kiuj shatas turismon, sporton au amuzajhojn, trovas plej bonajn okazojn en Svisujo.

ILO OR INTERNATIONAL LANGUAGE

Ni admiras bone kultivita agri, bela e neta vilaji ed urbi, piktinda vali, foresti, abismi, o montegi kun eterne blanka somiti. Anke omna ti qui prizas turismo, sporto od amuzaji, trovas maxim bona okazioni en Suisia.

Having read them aloud, do you not agree that the deciding factor should be—"easiest for the greatest number of people?" An impartial review of the I. L. problem and a vest pocket grammar can be secured at nominal cost from O. C. Roos, President "Rails," Beacon Chambers, Boston, Mass.

Super-Ducon

A Major Radio Invention

A. C. Type
$47.50

D. C. Type
$30.00

No more "B" batteries!

The Super-Ducon is the most important and valuable radio invention of the year. It brings many advantages to the set owners. Upkeep expenses are cut. No more of the expense and fuss of installing "B" batteries. No more poor reception due to weak batteries, *but* 100% performance *all* the time!

Ask your dealer for a copy of the 16-page Super-Ducon Booklet.

Dubilier

CONDENSER AND RADIO CORPORATION

"Quality Goods for Quality Readers"

DX—A Yuletide Story of Radio

(*Continued from page* 24)

Henry Carberry, having made a vain grab at the tails of Monroe Barrett's coat, was now surveying his circle of shell-backs, and apparently he agreed with Massingtree's estimate of their condition.

"You remind me," he suddenly said to them, "of my own experience with an undutiful child. Strangely enough, it happened about this time of year. She wanted to go on the stage—"

His voice had sounded very clear and loud in the silent room—louder than he realized, I guess, but now it was drowned by the voice of the giant in the radio machine.

"This is WXGZ speaking," says the giant. "Our next item will be a soprano solo—'Hark, the Herald Angels Sing,' by Miss Regina Blake. This is WXGZ, broadcasting the Christmas service of the Chicago Cathedral. Miss Blake."

"—came to me on Christmas Day," says old Henry Carberry, risking the loss of twenty dollars in fines, "and asked for my permission as a Christmas present. 'I know I can do great things,' she says, 'and I'd use a stage name, and—'"

A PIANO started playing in the radio machine; started, and then stopped again. I distinctly heard a girl's voice ask it to. The girl's voice was also in the radio machine.

"Just a second," it said; and then it said:

"Daddy!"

Well, I don't know what Henry Carberry had been just about to say, but anyhow, he never said it, although he'd got his fist up in the air, ready to

Tops the Gift List

A Music Master for Christmas! Have you thought of that?

It is a thousand gifts in one. A gift that re-creates in pure, audible tones all that's best in thought and entertainment, broadcast from five hundred stations daily.

Music Master is the musical instrument of radio. It embodies all of the proved principles of sound reproduction.

The reproducing unit is extremely sensitive and responds to the faintest impulses. The tone chamber is heavy cast aluminum, unequaled for developing sound waves free from distortion. And the amplifying horn is natural wood, mellow and resonant like a violin.

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Model VIII

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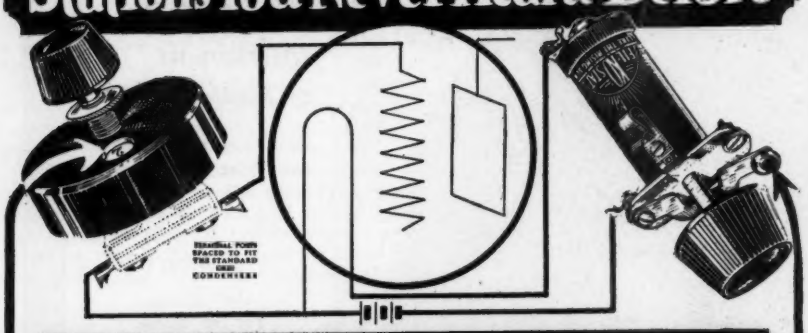

-thru scientific tube tuning

The most important (and most neglected) tuning unit on your set is the tube. It is the one thing you can adjust to bring weak stations to audibility—to eliminate distortion on local programs. Coils and condensers are easily tuned to incoming waves, but wave-length isn't everything. The antenna gets distant broadcasters but their signals never reach the phones unless you tune the tube to the different characteristics of the weak, distant stations. Here are two instruments distinctly designed to improve reception through their ability to control tube action— FIL-KO-LEAK to tune the grid by securing correct grid bias—FIL-KO-STAT to tune the plate-filament circuit by its control of electronic flow. Together they assure you maximum audibility, clearer signals and freedom from oscillations and other tube noises. *They bring in stations you never heard before.*

FIL-KO-LEAK $2
SCIENTIFICALLY CORRECT VARIABLE GRID LEAK
Individually Calibrated
In Canada $2.75

You will get stations you never heard before with Fil-KO-Leak. Clear up distortion and increase volume. You can "log" your Fil-KO-Leak as you do your other tuning units. Each Fil-KO-Leak is individually hand calibrated over the operating range of all tubes ¼ to 5 megohms. Set it for specified resistance and adjust it for best results. Resistance read in megohms through panel peep-hole. (Base-board mounting furnished.) Resistance element constant, accurate, not affected by atmospheric conditions, wear or jarring. Assures smooth, gradual control of resistance and correct grid bias. *Unconditionally guaranteed.*

FIL-KO-STAT $2
SCIENTIFICALLY CORRECT RADIO RHEOSTAT
with Battery Switch
In Canada $2.75

Tune your tube filament with Fil-KO-Stat and receive stations you never heard before, get greater distance, louder signals, sharper tuning, freedom from tube noises. Fil-KO-Stat is the only rheostat that permits adjustment over the entire operating range of all tubes and enables you to get maximum audibility in phones or loud speaker. And now the *improved* model is fitted with battery switch that attaches to the regular mounting screws. Distinctly signals "on" and "off" and enables you to break circuit without changing Fil-KO-Stat adjustment. Fil-KO-Stat fits any type tube in any hook up. *Unconditionally guaranteed.*

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SCIENTIFICALLY CORRECT "A" BATTERY SWITCH
Simple Sturdy Sure
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150 stations were logged on a Fil-KO-Stat equipped set, at Harrisburg, Pa., using a 1 meg. fixed grid leak. A calibrated Fil-KO-Leak was substituted for the fixed leak and in two nights 27 *new* stations—*never heard before*—were added.

Joseph J. Scott of Ottawa writes, "Among the *fifty-four new stations* I tuned in with my Fil-KO-Stat was 6KW, Tuinucu, Cuba, which I consider exceptional as it is only a small 100 watt station." And we have hundreds of other testimonials on file!

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"Quality Goods for Quality Readers"

give himself an emphatic wallop on the knee. At the word "Daddy!" he sort of gave a choke and a gasp, and sat there as if he'd been worse paralyzed than myself.

"This is for you, Daddy," says the girl's voice, and then the organ and the soprano started off together. My Lord, but that girl could sing! I haven't felt anything in any of my limbs for many a year, but I swear I thrilled all over. Arthur James actually started to sob and swear at the same time; and as for old Henry Carberry, sitting there with his fist still in the air—

"Hark! The herald angels sing,
Glory to the new-born King.
Peace on earth, and mercy mild.
God and sinners reconciled—"

Old Carberry had several attempts at gulping something down in his throat; and then, suddenly, as the next line started, he kind of woke up, got to his feet, and stood looking around him as if dazed. All his chums rose with him, and I was rather astonished to notice that no less than three of them were weeping—real, wet tears, just like those great calves—Arthur James, Saunders Massingtree, Bill Light, and —myself.

For a few seconds, Carberry said nothing; and then in a faint, wobbly voice, he called out:

"Van Alen!"

"Right here!" says the radio engineer, from the lounge.

Carberry turned and stared at him. For a moment, the sight of his enemy seemed to stiffen the old man, but only for a moment.

"That's my daughter singing!" he shouted suddenly, in the voice of a catamount robbed of its whelps. "You damned young rogue, where is she? Where's my little girl!"

Now Van Alen got up.

"She's at the Chicago Cathedral," he remarked, as the music came to an end. "She's staying at the Blackstone —until the day after tomorrow."

"When's there a train?" cries old Carberry piteously. "I—I—I must—"

"There's one from Grand Central in fifteen minutes," says Van Alen. "Wilson! Here's the butler with your hat and coat, sir; there's a taxi waiting for you at the door and—you have my best wishes. Good-night. Wait a minute. Your collar's all rucked up. There. Pleasant trip!"

WE all sat amazed for a few seconds after Carberry had bolted down the stairs, and then I ordered Arthur James to wheel me over to where Van Alen was still standing, with an expression on his face as though somebody had left him twenty-five billion dollars tax free.

Made by the makers of Laboratory Equipment

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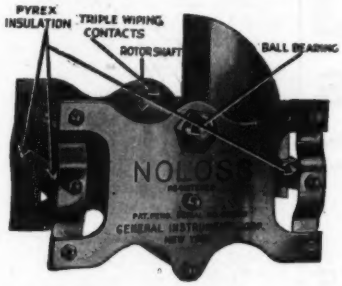
TRADE MARK

TYPE 51

PYREX INSULATION



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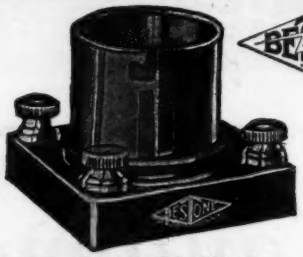

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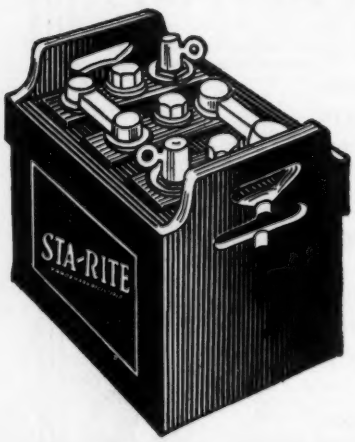

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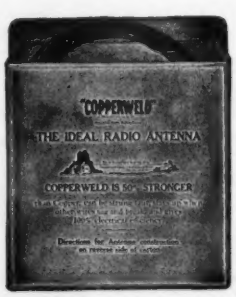

over ¾ of a million in service

COPPERWELD STEEL COMPANY

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It was some time before he could collect his thoughts enough to focus them on me.

"Is this the end of your campaign?" I asked grimly, when this had been done.

"Yes!" says young Van Alen.

"Do you consider that this," says I, indicating the doorway by which Carberry had gone out, "is any way to punish an old sorehead—giving him his daughter back?"

Van Alen blinked at me.

"Punish him?" he demanded. "Me—punish him? I wasn't punishing him. That wasn't the idea at all."

"Well, then, would you mind telling me," I asked severely, as the rest of the old stagers gathered around me, "what the idea of all this business has been? We-all have been spending our time and money co-operating with you, under the impression that—"

"For the last two years, you see," says Van Alen smiling, "I've been engaged to Miss Carberry. She sings under the name of Blake."

We gagged at him.

"She wouldn't marry without her father's consent," says the young man apologetically, "and so it seemed up to me, since I was a member of this Club, to—"

"We know the rest," says Arthur James. "In fact, we did the rest."

"Thank you!" says Van Alen.

"Don't mention it!" says I.

And then, after trying in vain to look indignant at the blushing young fathead, we all started to laugh and to say "Merry Christmas!"—all of us, including the remaining soreheads; and I did offer the cunning young devil that job I'd had in mind—at twenty-five thousand a year, which he refused, and no wonder; and that's about all of that story, my dear, and if you look through your notebook carefully when you get home, I wouldn't be surprised if you found a fifty-dollar bill somewhere in it.

Happy New Year!

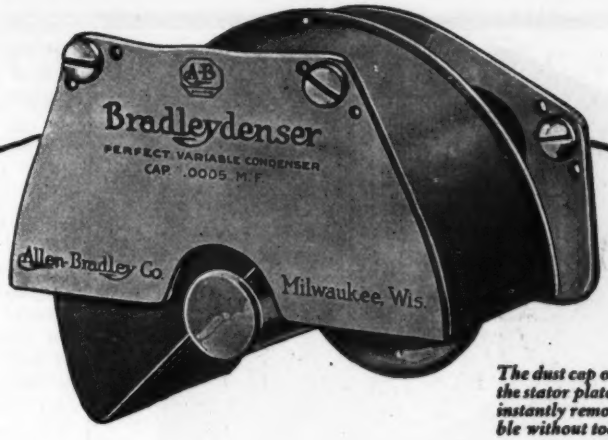
The Radio Widow's Plaint

(*Continued from page* 25)

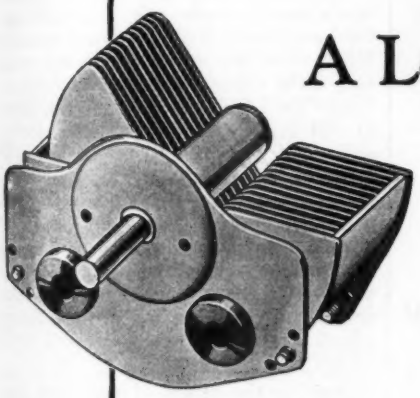
tion he departs for the early train.

You telephone Mrs. "Bill." Yes, they'd be delighted to come, so you phone the butcher to see "has he got any nice fryers," and yes, he has. The fryers do not arrive until after 4 o'clock and you discover upon investigation that the butcher is a poor judge of age, so the fryers become boilers.

Dinner is ready promptly, the Becks are there, and it does not need a practiced eye to see that they are famished. All is in readiness save John. When you are pretty well aware that your deft apologies are not hitting the mark, John rushes in, disheveled, perspiring, but bearing aloft a package. "Well, I got her!" he shouts trium-



The dust cap over the stator plates is instantly removable without tools.



A Low-Loss Condenser for Selective Receivers

THE New Bradleydenser embodies many new and important features that contribute to its high efficiency and low loss. One of the most significant innovations is the omission of the outer end-plate and the substitution of a unique bearing that maintains rigid alignment of the rotor plates without the use of unnecessary insulating or di-electric end-plates. There is almost no di-electric material in the Bradleydenser to absorb energy from the antenna oscillations.

The minimum capacity also is low, affording a wide range of control. This is an important advantage in sets to be operated from loops.

We shall be glad to send you complete information about the Bradleydenser. Drop us a line, to-day!

All plates are solid brass, carefully soldered at all joints. The Bradleydenser resistance does not increase, even after long use.

Standard Ratings and Prices

0.00025 M-F. $4.50
0.0005 M-F. 5.00
0.001 M-F. 6.00

The Bradleydenser has no vernier plates. The shaft is ¼-in. to fit any standard dial.

Allen-Bradley Co.
Electric Controlling Apparatus
283 Greenfield Avenue
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Notice the amazing reduction of insulating material to two small spacers. The di-electric loss is, therefore, very low

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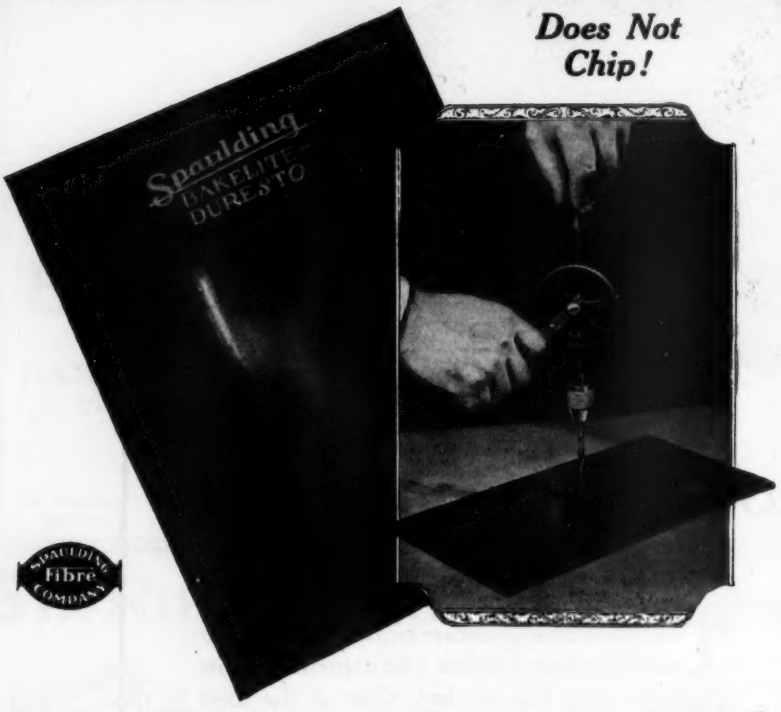

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Ask for catalog No. 10.

W.E. Fuetterer Radio Supply Co.
2123-25 Locust St. Louis, Mo.

phantly. Just who he has got we do not know, but he finally explains, "Got a new 'amplifter' here; best on the market. Now let's see how she works."

You lift your voice in protest. "Dinner's waiting, everything's getting cold. John, go up and get cleaned up right now, and for Heaven's sake, hurry up." You try vainly to keep the note of annoyance out of your voice, you'd hate to have the Becks say you "jawed" at your husband. But you may as well have saved your breath, for John appears to have another spell of total deafness, and the "amplifter" or whatever it is, is being connected and tried out. Bill stands by with, "Oh, yes, John, I see. Yes—."

You have a great and overwhelming desire to lift up the pot of simmering food and bring it down smartly upon John's head, then you recall that you forgot the coffee cream and when you finally catch John's eye and ask him to run quickly to the corner grocer's and get it, you may be prepared for a scene of violence. Can't you see he's busy? Good Lord, that's a woman for you. Nothing to do all day but fool around the house, then ask a man who's done a hard day's work to go way down to the next block after cream! By gollies, it's a good thing offices aren't run on household efficiency!

And in the midst of this you slip out the back way and go for the cream yourself.

Dinner is late, but what matters that? The "amplifter" works. The dumplings are of the texture of shoe leather and taste like an old bath towel. The coffee has lost its clear amber hue from being warmed over, the salad is sodden. None but Mrs. Bill and you are aware of that, however, because Bill and John are in a sea of words, the meaning of which will never be quite clear to either of you.

A new light lies in Bill's eyes. He toys with his food and hastens from the table to have a number of little points illustrated by the set itself. You realize that he is slipping, but cannot save him.

Presently you go out to the kitchen to start the dishes and while so doing, accidentally push from the range a soldering iron which has been heating, and it falls striking upon your pet corn.

When the agony has subsided, you hear Bill from the other room saying, "Well, now I'll get all the stuff together, and you'll give me a hand till I get onto it, huh?"

"Sure thing, glad to," John replies. I see very little of John for the next five days. . . . . .

Last week Mrs. Bill said to me, "I can't make up my mind whether to divorce Bill or bust up his radio set. One or the other has got to go!"

Lord help us! It's contagious!

Appliances and Devices

New Amplion Loud Speaker

THE new line announced by The Amplion Corporation of America, New York City, includes loud speakers in four sizes and phonograph units in two sizes.

All models are equipped with the new Amplion "Floating Diaphragm" feature. The diaphragm, kept from contact with metal by rubber gaskets, rests on a narrow ledge in the case, lightly held there by a spring ring with enough pressure to prevent "chatter" when exreme volume is desired. Unusual sensitivity, purity, clarity and naturalness of tone are said to result.

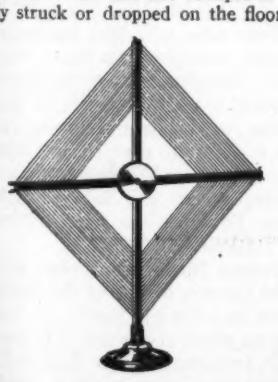
Another Amplion feature is the use of rubber insulation between the loud speaking unit and the elbow of the loud speaker, and between the elbow and the horn, to eliminate distortion, ring or resonance. The Amplion loud speaker units may also be detached from the loud speaker, and with proper adaptors attached to phonographs or used in loud speaking cabinets.

The four new models of loud speakers are the Amplion AR-102, known as the "Dragonfly," the Amplion AR-111, known as the "Junior;" the Amplion "Junior De Luxe" AR-114; and the Amplion DR-19, which is the largest model and is known as the "Dragon." All have the dragon-shaped elbow, which provides unusually long tone travel.

The phonograph units are the Amplion AR-35-A, which is the larger and is equipped with a double resistance switch for use with or without a power amplifier. The Amplion AR-67, which is the "Junior" model, is not equipped with the switch. All Amplion units have an adjustment, which permits "tuning" them to individual sets.

Red Seal Collapsible Loop Aerial

THE Red Seal Collapsible Loop Aerial made by the Manhattan Electrical Supply Co. of New York City, is designed for use with portable and permanently installed radio sets. The instrument is of rigid construction throughout. A special feature is the method of fastening the arms holding the wire in position when the loop is erected. This type of construction results in a rigid frame which will not collapse if accidentally struck or dropped on the floor.



The loop is attached to the base by means of a special plug which permits rotation of the loop and assures positive contact with the base at all times. Connection to the receiving set is made in the base.

A special feature of the Red Seal Collapsible Loop is a scale on the base on which can be marked the position in which the loop must be pointed to receive any given station.

Sufficient wire is wound on the loop frame to cover the broadcasting wave-length range with a variable condenser of approximately .0005 M. F. capacity. For this purpose, Red Seal Variable Condenser No. 2593 is recommended as having a high efficiency and an excellent vernier adjustment.

Bel-Canto Loud Speaker

IN the Greater Bel-Canto Loud Speaker the horn was specially designed to give the greatest amount of volume without distortion. Sound waves set up a false vibration in metal, wood or fiber. This false vibration is mixed with the true vibration of the unit in the base and causes an echo which

(*Turn to page* 79)

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Anti-capacity SWITCHES
Lower-Loss Vernier VARIABLE CONDENSERS
Lower-Loss PHONE PLUGS
Lower-Loss RHEOSTATS
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-and then hear the difference!

Anti-Capacity JACKS 5 types

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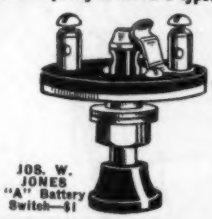

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Jos. W. Jones Jacks and Switches kill capacity effects. The long parallel leads of old-style jacks and switches act as condensers. Jos. W. Jones Jacks and Switches pass the "juice" through without loss. *Ask for the switches with the little red button.*

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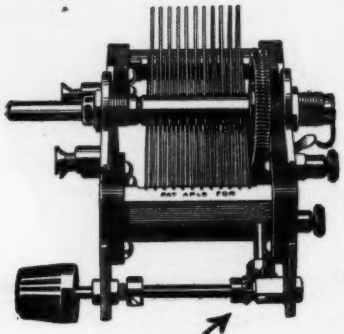

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Because of their unique qualities, A. B. Condensers are selected for the best sets. Mechanically and electrically there isn't a finer condenser made—and for fine tuning they stand alone.

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AMERICAN BRAND CONDENSER

$5.00

IN CANADA $7.00

See Page 34

14-inch Bell Polished Pyralin

Aluminum sound column

Burns

A Speaker of Distinctive Lines

All the volume you want with no sacrifice of clearness or naturalness. The full true tones of voice or music are reproduced. Equal to hearing the original. Speaker Unit only supplied for use on phonographs —fits any make.

No. 205B—Polished black flare..... $22.50
No. 205D—Shell pyralin flare..... 25.00
No. 100—Unit for phonograph use..... 10.00

Makers of telephones for 30 years.

Manufactured by

American Electric Company

State and 64th Streets
CHICAGO

"Quality Goods for Quality Readers"

Arthur Stringer's Radio Movie

(*Continued from page 27*)

the tower and stops behind a tree. Making sure no one is watching, he takes his crutch, which is in reality a radio receiving set in disguise, and listens-in on Powell. After getting the message he hobbles toward the guard stationed at the tower and wig-wags a signal to him. The guard leaves the tower and goes to a small shack nearby where he fastens a message to a carrier pigeon and sets the bird loose.

The cripple continues on his way to a nearby golf course where the Admiral is about to start play with Claire Lacasse, a beautiful woman of foreign blood. As the Admiral busies himself with the game the cripple catches the eye of Claire and delivers a message. Claire asks the Admiral to excuse her, and leaves. Going to the nearest phone booth Claire calls Mark Drakma, a man of mystery who moved luxuriously about the fringes of Washington's social and political life. Claire tells him that a pigeon is on its way to him with a message.

In the tower Mary and Alan are talking about the invention when they see an auto drive up to the foot of the tower. Half a dozen men step out of the car. One of them is dressed in the uniform of an officer of the navy. Sensing trouble Alan tells Mary to hide, and that if anything happens to him for her to destroy the invention.

The men mount the stairs to the tower and tell Alan that they have orders from the Secretary of the Navy to bring Alan with them to Washington. Holt sees several inaccuracies in the officer's uniform and orders them out. The men attack Alan and succeed in completely overpowering him. As they go into the next room to get the machine they find Mary destroying it. Mary is bound and carried away while Drakma, who is heading the raiding party, has Alan carried to a waiting seaplane.

The seaplane takes Alan to a yacht where he is kept imprisoned for some time. Later he is brought before Drakma, who tells him he must build another complete machine. Holt refuses. Drakma brings Mary in and threatens to turn her over to the crew of one of his rum-running vessels. Holt is about to give in, but Mary refuses to let him. Drakma then orders the ship to set sail for the Bahamas, where Drakma has his rum-running fleet stationed.

Drakma turns Mary over to Kurder, the captain of one of the boats, with orders to keep his hands off her until Drakma gives the word. A few miles away Drakma dumps Holt off on a small island containing a shack and some food. Drakma tells Holt that

Your radio set is no better than its reproducing units

The Red Seal Phonograph Attachment

Makes a loudspeaker of your phonograph. The soft rubber connection allows you to attach it to almost any type of tone arm. The tone quality is excellent and the volume sufficient to fill an ordinary room.

Price $5.00

No matter how good your receiver, it cannot give best results and maximum pleasure unless your reproducing units also are of the same high quality as your set. This applies to both headset and loudspeaker—every set should have both, and each should be as good as it is possible to secure.

The Red Seal Headset

The Red Seal Headset is ideal for DX work. It is good looking, comfortable to wear, and extremely efficient in operation. You cannot buy a better pair of ear phones at any price, yet the Red Seal Headset costs only $6.00.

A flexible head band covered with washable, soft moulded rubber lightly holds the phones against your ears with a pressure easily adjustable. There is nothing to catch the hair—no projection to scratch furniture.

Only the best obtainable materials enter into the construction of the ear phones. The magnets are especially large and made of tungsten steel. Pole pieces are of silicon steel. The phones are designed especially for the reception of broadcasted programs. As a result you get perfect clearness and pull in faint distant signals with ease.

The Manhattan Junior Loud Speaker

This loudspeaker presents the greatest value we know of at $10. Its tone has excellent musical quality and surprising volume. The reproducer unit is not just a headset in a horn, but a unit especially designed and constructed to operate the long air column of the horn.

The base contains the famous Manhattan "Concert Modulator" which allows you to adjust the reproducing unit to secure perfect reproduction under varying conditions of operation.

See and hear the Manhattan Junior at your dealer's. It's a wonderful value at $10.

Manhattan Electrical Supply Co.
Incorporated
New York Chicago St. Louis
San Francisco

Manhattan
RADIO PRODUCTS

MADE BY THE MAKERS OF THE FAMOUS RED SEAL DRY BATTERIES

"Quality Goods for Quality Readers"

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ANDREWS
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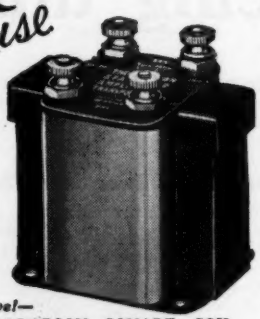
More set makers use



Exclusive!—
THORDARSON SQUARE COIL LEAK-PROOF CONSTRUCTION

The Thordarson-made layer-wound SQUARE coil fits snugly around the square core. No air space between coil and core (exclusive!) No lost energy, no lost volume (especially on low notes), no leaks from primary to cause howls in set. Oversize core provides 50% larger magnetic circuit—minimizes core losses, prevents over-saturation. No rivets or screws through core to cause short circuits or eddy current losses between laminations (exclusive!) Do you wonder Thordarson produces more transformers for more makers of quality sets than all competitors combined?

New York City, Sept. 25, 1924
Thordarson Electric Mfg. Co.,
500 W. Huron St., Chicago.

The transformers which you supplied to equip the Radio on the schooner Bowdoin stood the extreme temperature of the Arctic without the slightest mishap. These transformers are in exactly the same condition today as they were the day they were installed, May, 1923.

Sincerely yours,

(signed) Donald B. MacMillan
WNP

Follow their lead
—amplify with Thordarsons!

Can you imagine nationally famous builders of sets costing up to hundreds of dollars each, jeopardizing the tone quality of their instruments with anything short of the best amplification? Of course not! Then remember, in buying transformers, that Thordarsons are standard on thirty-four makes of high grade sets. That leading set manufacturers use *more* Thordarsons than all competitive transformers combined.

Replace your present audio frequency transformers with a pair of Thordarsons. You'll be astonished, delighted. Distorted speech will disappear. You will find they amplify with *even* volume over the *entire* musical range. Note below some of the reasons why. Buy a Thordarson-equipped set—or follow the lead of the leading makers and build with Thordarsons. Increased production this season enables any store to supply you. If your dealer has not yet received his stock, you may order from us by mentioning his name. Interesting bulletins, sent free.

They are unconditionally Guaranteed

THORDARSON
Super
AMPLIFYING TRANSFORMERS
Standard on the majority of quality sets

Thordarson "Super" Audio Frequency Transformers are now to be had in three ratios: 2-1, $5; 3½-1, $4; 6-1, $4.50. Thordarson Power Amplifying Transformers are $13 the pair. Write for latest bulletins.

—New!—
We announce the Thordarson INTERSTAGE Power Amplifying Transformer. Provides two stages of POWER amplification when inserted in circuit between Input and Output Power Amplifying Transformers. Four tubes are required, but the quality of the reception more than repays you. Only Thordarson builds a transformer of this type. Price $8. Write for free hook-up.

THORDARSON ELECTRIC MANUFACTURING CO.
Transformer Specialists Since 1895
WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS
Chicago, U.S.A.

Greater Distance—Less Noise
TURN-IT
ADJUSTABLE
GRID LEAK

Only $1, at your dealer, or direct from us
TURN-IT RADIO SALES, Inc.
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EMPIRE
Oiled Tubing

Real Radio Sets of today—the kind that last long and work best—are insulated with genuine Empire Oiled Tubing.

MICA INSULATOR CO.

68 Church St. New York
542 So. Dearborn St. Chicago
Works: Schenectady, N. Y. 2030-F

"Quality Goods for Quality Readers"

he will find plenty of tools with which to work to rebuild a model of his invention. Holt is also told that there is a small power radio sending and receiving set with which to amuse himself. This radio set, Holt is told, is for his use in communicating with Mary, who is being held on a vessel a short distance away. Drakma's idea is to torture Mary and have her complain to Holt so as to make Holt hasten the making of the machine to free Mary from her bondage. Holt also finds an uncompleted model of his invention. This had been made by Drakma from earlier plans which had been stolen.

Back home the Admiral and his friends are becoming more and more discouraged in their search for Mary and Holt. A suggestion is made that they broadcast a message from one of the powerful stations. This is done, but no results are obtained.

In the meantime Holt has been working on a make-shift generator to increase the power of the radio apparatus. He is listening in when he hears a message saying that the President of the United States is about to broadcast and that the air is to be kept clear for ten minutes. Seizing the opportunity of catching some passing vessel with the air clear, Holt sends out word of the whereabouts of Mary and himself. Drakma, aboard his yacht about to listen to the President's message, hears this and orders the ship to set sail for the island. Admiral Walsworth, on board his flagship, also gets Holt's message and makes for the island.

After delivering the message Holt tries to get Mary. Tuning in he hears Mary cry for help. Hastily floating a raft he has made for an emergency, Holt starts to paddle his tedious way to the schooner several miles away.

Mary is trying to save herself from Kurder and finally breaks loose. By lowering the only dinghey on board Mary tries to make her escape, but is so slow with her rowing that she is captured again. The crew of the schooner are fighting for the privilege of having Mary when Holt comes aboard. With the aid of a belaying pin Holt is successfully holding off the crew when Drakma's yacht comes alongside.

Drakma is about to take the pair with him when the battleship is sighted. Drakma tries to make his escape in the boat, but a shot from the battleship makes him change his mind. The Admiral then comes aboard and tells Holt that the Government is ready to reward him for his invention. Holt wants to know if the Admiral is willing to give some reward of his own. The Admiral, looking at Mary, understands and smilingly gives his consent.

Make it a MAGNAVOX Radio

TRF-50

LET your radio gift convey lasting evidence of sound judgment and true discrimination by selecting a *Magnavox.*

Encased in a carved mahogany cabinet, the Magnavox gives a splendid first impression which will only be heightened in daily use.

The panel tells its own story of simplified control: a most ingenious method of gearing together the several resonant circuits makes it possible to obtain stations directly, **on one dial.**

Every Magnavox owner can also testify to the remarkable number of programs brought in daily, and to its superb tone and volume.

Magnavox Radio Products are sold by reliable dealers everywhere. Literature on request.

THE MAGNAVOX COMPANY

OAKLAND, CALIFORNIA

New York:	*Chicago:*	*San Francisco:*
350 West 31st St.	162 N. State St.	274 Brannan St.

Canadian Distributors: Perkins Electric Limited, Toronto, Montreal, Winnipeg

Magnavox Receiving Set
TRF-5

A 5-tube tuned radio frequency receiver with Unit Control, in carved mahogany cabinet

Magnavox Receiving Set
TRF-50

Identical with the above as to circuit and panel but encased in carved mahogany period cabinet with built-in Magnavox Reproducers (shown large at top of page)

MAGNAVOX
Reg. U.S. Pat. Off.

12R

R3 M4

Magnavox Reproducers for all receiving sets

The first radio Reproducer ever made was the famous Magnavox electro-dynamic type.

These instruments contain reproducing units of extreme sensitivity and power.

Magnavox Tubes

Can be substituted for ordinary tubes to great advantage in any receiver

Grand Opera Programs

Brought Into Your Home

WHEN you own a Radiodyne you can hear singers' voices and orchestral harmonies faithfully reproduced thru the loud speaker. The Radiodyne brings these enjoyable programs into your home so clear and distinct that you lose nothing by not being at the opera. With the Radiodyne you will not be troubled by interference from nearby stations. The Radiodyne selects and holds the program you wish to hear.

Tunes Through New York Local Stations

RADIODYNE

Gets Over 109 Stations Loud and Clear

"We have tuned in Kansas City, Jefferson City, Hastings, Elgin, Chicago, Dallas, Atlanta, Pittsburgh, Philadelphia and many other stations in the last three nights right thru local stations." Clarence I. Goldman, New York City.

"Have received over 109 different stations, loud and clear. I can tune out Cincinnati and tune in Oakland without interference. I tuned in Oakland when it was just getting dusk here." John W. Porter, New Butler, Wisconsin

Write for illustrated folder which describes the Radiodyne in detail. If you buy a radio before you have a demonstration of the Radiodyne you will surely regret it.

Western Coil & Electrical Co., 316 Fifth St., Racine, Wis.

No. 1 of a series of 10
"FILTER FACTS"
Follow them thru monthly

RIPPLES. D. C. Generators operating under normal conditions have three sources of disturbance, i.e. commutator ripple, slot ripple and the noise of moving contact.

COMMUTATOR RIPPLE. Armature windings are a series of coils around the armature, forming one large coil, with taps brought to commutator segments. The voltages induced between commutator segments are not equal, and vary as the armature revolves. The voltage is maximum at A, minimum at B, and maximum, but in the opposite direction, at C. The series parallel battery connection is analagous. As a brush leaves one segment and passes to the next the voltage changes slightly. The resultant ripple is known as commutator ripple.

SLOT RIPPLE. As each slot passes a pole tip there is a slight interruption of the field at this point. Each surge in the field slightly changes the value of the voltage induced in the coils. The resultant ripple is known as slot ripple.

The frequency in cycles per second for the above ripples may be expressed—

$$Fc = \frac{\text{No. of segments X r.p.m.}}{60} \qquad Fs = \frac{\text{No. of slots X r.p.m.}}{60}$$

NOISE OF MOVING CONTACT. The infinitesimal sparking caused by microscopic uneveness in the surfaces of both the commutator and the brushes produce an audible noise in the transmitter

The ratio of ripple voltage to maximum voltage for A.C. equals 200%.
The ratio of ripple voltage to maximum voltage for R.A.C. equals 100%.

THE AVERAGE RATIO OF TOTAL DISTURBANCE, AS OUTLINED ABOVE, FOR ESCO GENERATORS IS .9 OF 1%.

ELECTRIC SPECIALTY COMPANY
TRADE "ESCO" MARK
231 S SOUTH STREET STAMFORD, CONN., U. S. A.

Makers of Motors, Generators, Dynamotors and Motor-Generators that give the maximum miles per watt.

John Hays Hammond, Jr.

(*Continued from page 29*)

rangements, of course. A triple control was necessary. The engine must be controlled, also the steering gear, and finally, for war purposes, a mine-dropping apparatus.

Back in Gloucester, early in the course of the experiments, it had been proved that radio control could be maintained against all efforts of an enemy to prevent it, at least up to within a very close range. The Navy's *Dolphin*, with a thoroughly up-to-date radio transmitting apparatus was sent to Gloucester, and tried for a whole day to discover the combinations of secret wavelengths that Hammond used to control the movements of his boat, and to confound this baffling control with counter-signals of its own. But Hammond always succeeded in guiding his craft without difficulty up to within two or three hundred feet of the represented enemy vessel, before that enemy managed to interfere with the operation of the radio-guided rudder. A torpedo could have been launched upon its deadly and certain errand well before that moment.

It seems a wonderfully fitting thing that these important experiments, of such vast concern to naval science, should have been carried on to Hampton Roads, where half a century earlier had been staged the dramatic test of strength between the two young naval giants, the *Monitor* and the *Merrimac*, which American inventive genius brought forth to inaugurate a new era in the annals of sea-fighting.

It was during the period at Fort Monroe that a 100-gallon gas tank overflowed onto the engine and ignited. The pump, driven by the engine, could not, of course be operated. Pyrene extinguishers were hurriedly employed. The Pyrene gave out, and the fire started up afresh. Things looked critical, when a destroyer came up and averted disaster. The way of an inventor may be fraught with risk.

In the Fall of 1918 the H-4 was taken to New London, where experiments were continued. Success was practically achieved; but so, too, was military victory in France. With the end of the war came too an end, or at least a discouraging diminution, of official interest and co-operation.

* * *

Today Mr. Hammond ranks in the forefront of radio inventors. The radio world is fairly captivated by his genius, and awaits with eagerness his successive revelations. The list of patents accredited to him in the Patent Office files is a formidable one.

It is well to remember that his genius is not the sudden germination of a lucky moment. It is the fruit of years of incessant study and concentrated ex-

Aristocrat Model

The Bestone V-60 Five-Tube Receiver in beautiful, distinctive, antique polychrome cabinet, with built-in high-grade loud speaker and battery compartments.

List....**$165.00**

BESTONE
V-60
TRADE MARK

The Aristocrat of Radio

A Xmas Gift that will Thrill, Satisfy and Serve

Give the finest of all Radio Receivers for Xmas—the one every one knows as the peer of them all—THE BESTONE V-60.

Gives a new meaning to the word Radio.

There is prestige in owning a Bestone V-60.

There is philosophy in buying the best.

A piece of furniture worthy of the machine it contains.

Write for Particulars

Manufactured and Guaranteed by

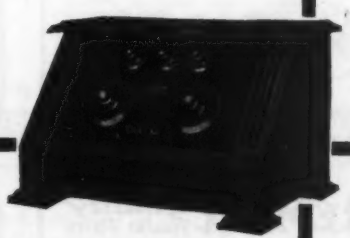
HENRY HYMAN & COMPANY, INC.

476 Broadway, NEW YORK — 212 W. Austin Ave., CHICAGO

Imperial Model

Imperial Model—Bestone V-60 Five-Tube Receiver in beautiful mahogany cabinet.

$115.00



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National VELVET VERNIER Condensers and Dials

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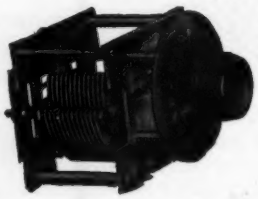

PRICES of Condenser
(Including 3-inch Dial)

.001 $7.00
.0005 $6.00
.00035 $5.75
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DIAL Only

4-inch, $2.50 3-inch, $2.00

"Perfect Resonance Control"

That's the way a satisfied purchaser of a NATIONAL VELVET VERNIER DIAL and CONDENSER describes the liquid smoothness and flexibility of this **perfect** slow-motion dial and low-loss condenser.

Perfect because of perfection of design and skilled craftsmanship. No grating — no backlash — no loss. Every part in perfect accord.

Lustrous finish and graceful lines give a "million-dollar-look" to the home-built set.

NATIONAL COMPANY
CAMBRIDGE MASSACHUSETTS

Lowest Minimum Capacity

Greatest tuning range. Ratio of 1 to 74. Twelve other features in Premier Crofoot. Electrically and mechanically a real job of engineering. Record low phase angle loss. Made of brass and hard rubber throughout. $2.75 to $3.75. Vernier attachment, dial included, 75 cents extra. Send for free Bulletin No. 94 giving all exclusive features and showing full Premier line.

"CROFOOT" Vario Condenser
"with the red stripe"

Premier Electric Company
3809 Ravenswood Ave.
Chicago

PREMIER *Quality Radio Parts*

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fits any Grid Leak mounting

FRESHMAN PLUNGER TYPE VARIABLE GRID LEAK was designed especially for the non-technical set owner who can replace in an instant the fixed grid leak with this new, efficient cartridge type Variable Grid Leak: without requiring the change of a single wire.

At your dealer or by mail postpaid. Write for free catalogue.

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106-7th Ave. New York

"Quality Goods for Quality Readers"

periment,—much of it done as has been here set down—at Gloucester and Fort Monroe amid stress and storm.

Mr. Hammond says of this preparatory period, "I began in 1909 to work on the problem of the distant control of moving bodies through the action of electromagnetic waves. My first experiments conducted at Gloucester utilized a transmitter which produced the short electromagnetic waves visible to the eye." At college he worked a coherer to activate some mechanical contrivance. Then at Gloucester he was able to control a boat by light and make it follow a search-light beam. "My later experiments in that year," continues Mr. Hammond, "utilized the longer electromagnetic waves invisible to the eye and commonly used in the practice of radio communication. First he achieved control with light beams, and then with radio waves as we know them.

It should be remarked in passing that during the early war period Mr. Hammond brought into play some of his early interest in chemicals and explosives. He invented at this time a projectile loaded with thermit and a poison gas. The thermit upon ignition shortly after leaving the muzzle became a molten mass with a temperature of 5,400 Fahrenheit, a deadly Vulcan-weapon worthy of a battle between Titans, while the prussic acid with which it was charged was designed to overwhelm great areas and render abortive any effort to extinguish the conflagration caused by the arrival of this messenger of death and destruction.

After the war, these experiments gave place, as is natural, to the development of the radio communication which was to be "broadcasting," because this was to assume paramount importance, and the war-time radio control of water craft and torpedoes a matter of less urgency. So Mr. Hammond has been busy with broadcasting and has only recently returned from a stay in Italy where he has helped install his system of license-tax radio broadcasting.

Three stations, at Rome, Milan and Messina, will operate on wavelengths of 425, 395 and 455 meters respectively. Each subscriber will pay a license fee of 50 lire and a further fee ranging from 20 lire for a crystal set or a single vacuum tube apparatus to 150 lire for the larger sets.

While in Rome, Mr. Hammond had an audience with the Pope, whom he describes as being a real "fan" who understands the operation of his set and is greatly interested in the advance of radio and broadcasting.

Mr. Hammond is at present experimenting with transmission on short wave lengths.

GOLDEN-LEUTZ
PLIODYNE-6
TRADE MARK REG.
"The Perfect Broadcast Receiver"

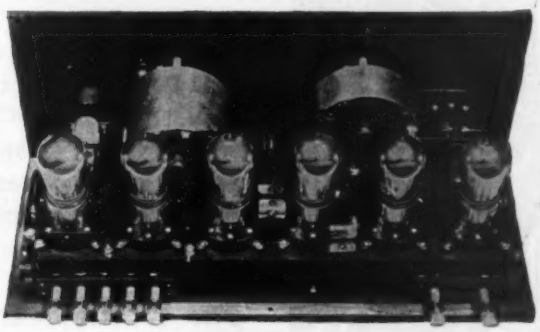
A New Superior Broadcast Receiver

SIMPLE—LONG RANGE—HIGHEST QUALITY
NON-RADIATING—NON-REGENERATIVE

$95.00
Completely Constructed
WITHOUT ACCESSORIES
TRANSPORTATION PREPAID

Two Stages Tuned Radio Frequency—Detector and Three Stages of Audio Frequency Amplification.

PLIODYNE 6
Front View Showing Simplicity of Control



PLIODYNE 6
Interior View Showing Compact and Efficient Design

A New Marketing Plan

Rather than sell this high grade receiver to wholesalers at $190.00 less 50% discount we are going to sell it direct to you at wholesale, saving you $95.00 and at the same time giving you the finest set that can be bought for twice the amount.

Inspect the "PLIODYNE 6" at Our Expense

We will send the "Pliodyne 6" C. O. D. transportation prepaid with privilege of inspection. If it does not appeal to you as the finest medium priced broadcast receiver you ever saw, return it to us at our expense.

Otherwise take advantage of

A Free Trial

Accept the C. O. D. and try the "Pliodyne 6" for five days, if you are not satisfied in every way return it at our expense and we will return your money.

Our Guarantee

We guarantee every GOLDEN-LEUTZ "Pliodyne 6" to be the finest broadcast receiver that can be manufactured using 6 tubes or less and to be satisfactory to you in every way and to reach you in perfect condition.

You take no risk whatever in sending us your order for unless you are completely satisfied with the receiver and with your saving you may return the receiver to us and we will refund your money.

Address

GOLDEN-LEUTZ, INC.
476 BROADWAY NEW YORK CITY

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Note:—We reserve the right to withdraw the Free Trial Offer if our Factory Production is exceeded.—Golden-Leutz, Inc.

Set building is simple with Dubilier Devices!

The MICADON: Use this standard fixed condenser when you build. It has permanent capacity. Its extension tabs make it easy to install. 90% of all sets made use of Micadons.

The DUCON: Save the expense and labor of erecting antenna. Buy the Ducon—the standard socket plug. Just screw it into your lamp socket and it will pick up programs clearly and distinctly!

The DURATRAN: Build a powerful set by using this radio frequency transformer. It amplifies with a constant of over twenty on the complete broadcasting band—225 to 550 meters.

Dubilier

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MORE PROFITS To Dealers Who Buy Nationally Advertised Radio Goods from Our Bargain Catalog! *Write for It Today!* AMERICAN RADIO MFG. CO. Dept. U 6 WEST 14TH ST. KANSAS CITY, MO.

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ATTACHED to your phonograph, N & K Imported Phonograph Unit gives you a loudspeaker whose clear, rich, mellow tone will delight everyone who hears it. Free from blares and blasts, from whines and rattles. Attaches instantly to any standard phonograph. $7.50 at leading dealers in radio and phonographs. Write for folder. TH. GOLDSCHMIDT CORP. Dept. W12, 15 William St., New York, N. Y. 41 Common St., Montreal, P. Q.

N&K

Reg. U. S. Pat. Off. IMPORTED PHONOGRAPH UNIT

CRESCENT LAVITE RESISTANCES
ABSOLUTELY NON-INDUCTIVE
12,000, 48,000, 50,000, 100,000 Ohms
List $1.50 Each

Special Sizes to Order
USED IN ALL CIRCUITS AND RESISTANCE COUPLED AMPLIFIERS
When better resistances are made they will bear the Crescent label.
Dealers write for discount
CRESCENT RADIO SUPPLY CO.
3 LIBERTY ST. JAMAICA, N. Y.

The Plunketteers

(*Continued from page* 33)

big pictures which star alone in Broadway theaters such as "The Sea Hawk" and "Monsieur Beaucaire."

This month (December) the "Plunketteers" will do more than their bit in contributing to the pleasure of the musically inclined listeners-in. There will be heard, for instance, the ever popular Kitty McLaughlin, whose presence on the Strand stage has drawn patrons for the last four seasons. Miss McLaughlin who comes from Rutland, Maine, was trained in the New England Conservatory of Music, and has held a number of church positions in New England. She may now be heard at the Munn Avenue Church in East Orange. This lady, who sang as a child, is one of the few fortunate people who has been able to fairly sing her way through life. At all times in her education her voice has supported her. Last year she sang at the Maine Festival, which is given in the Berkshires at Bangor and Portland, and appeared there with Calvert and Bori of the Metropolitan. On her arrival in New York, she became John Murray Anderson's prima-donna in his first review at the Palais Royal. But operatic arias are her forte, and it is these in which she will be heard this month.

"What do you like to do outside of singing?" I asked Miss McLaughlin. To which she very promptly replied:

"Outside of singing I like to sing."

Other favorites who will be heard at the Strand include the Strand Quartet with the Messrs. Young and Mellor as tenors and Reardon and Thomas as bassos. They will be particularly welcome during the holiday season, for they will do the Christmas Carols.

The most unusual feature on the schedule of the Strand Theater for early December comes in line with the picture, "The Sainted Devil," in which Rudolph Valentino stars with Dagmar Godowsky. Miss Godowsky, who is the daughter of the famous pianist, Leopold Godowsky, is herself a pianist and singer of note and she will appear as a broadcaster early in December. But more important is the fact that her father, the great Leopold Godowsky himself, will for the first time be heard over the air by a radio audience on the same occasion.

The Strand orchestra itself is worthy of note, as every man in it, without exception, has been in a symphony or in the Metropolitan Opera orchestra. The fact that the Strand offers these musicians a steady fifty-two weeks a year engagement with no lowering of their musical skill, makes it possible for Carl Edouarde to take his choice of the men in the numerous symphony orchestras of the country. This, of course, is in itself sufficient explana-

(*Turn to page* 80)

Appliances and Devices

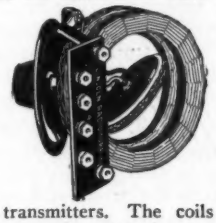
(*Continued from page 69*)

creates distortion. The new Bel-Canto horn is made of an entirely different material than used in any other horn and is an exclusive Bel-Canto product, it is made in layers, each of a different density. Each one has a certain neutralizing effect which entirely eliminates the false vibration.

The Bel-Canto Loud Speaker possesses the purest possible tone quality and the greatest volume possible to obtain without a power amplifier. It stands 29½ inches high and the bell is 15½ inches in diameter.

Lincoln Oscillascope

THE Lincoln Oscillascope is a compact unit consisting of three coils, mounted in such a manner, that all coils may be in the same plane or one may be varied in its relation to the other two. It is a perfect oscillator for super-heterodyne sets, separate heterodynes for continuous wave reception,



or small transmitters. The coils are machine wound and accurately computed for frequencies which this oscillator is designed to cover.

Variations of coupling are made from the front of the panel. It is unnecessary to touch the coils and change the oscillator frequency while making these adjustments.

Low Ratio Thordarson Transformer

A 2-to-1 ratio audio-frequency transformer, which is reported to be ideally suited for three-stage amplifiers as well as reflex purposes, has been placed on the market by the Thordarson Electric Manufacturing Co., of Chicago. Some of the prominent set makers are already using it in their latest models.

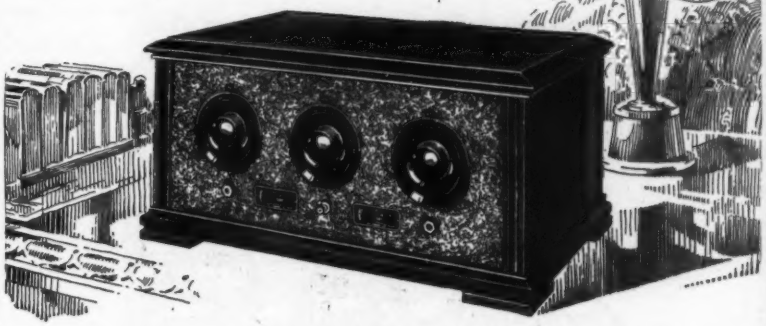
This Thordarson product has the same type of layer wound square coil, snugly fitting around the square core, that is also found in the 3½-to-1 and 6-to-1 models made by this manufacturer. It is claimed that with a square coil, the layers cannot slip and cause open circuits, also that the snug fit eliminates air spaces between coil and core, thereby preventing losses of energy, losses of volume on low notes especially, and avoids leaks from the primary, which may cause a set to howl. The core has an oversize ¾-inch cross section, that provides approximately a 50 per cent. larger magnetic circuit, which it is stated minimizes core losses and prevents oversaturation.

Broad ribbon leads, locked in the coil, give short, direct, substantial connections to the patented inner-locked terminal posts to dispense with the possibility of tangled or broken wires inside. Another feature, which is said to be exclusive, is that the special silicon steel core is clamped in the case instead of being held by rivets or screws that might cause short circuits or eddy current losses between the laminations.

(*Turn to page 82*)

EISEMANN

ELECTRICAL EQUIPMENT



Type 6-D Broadcast Receiver

Non-oscillating — Non-radiating

SPECIFICATIONS

Circuit: Two stages of tuned radio frequency amplification, detector and two stages of audio frequency amplification. Non-oscillating. Non-radiating. Astatic transformers used to minimize mutual induction.

Tubes: Five in all. Jacks provided for either five or four tube operation.

Batteries: Either storage or dry-cells.

Cables: Complete set supplied for "A" and "B" batteries.

Wave Lengths: 200 to 600 meters, with uniform efficiency of reception.

Aerial: 75 to 125 feet, single wire.

Panel: Aluminum, with attractive crystal black finish. A perfect body capacity shield.

Dials: Sunken design. Shaped to fit the hand and permit a natural position in tuning.

Rheostats: Adequate resistance for all standard base commercial tubes.

Condensers: Single bearing, low leakage losses.

Sockets: Suspended on cushion springs which absorb vibrations.

Cabinet: Mahogany, with distinctive lines and high finish. Ample space provided for "B" batteries.

EISEMANN

THE real, intrinsic value of the 6-D Receiver can be fully appreciated only by making direct, side-by-side tests with other makes.

Such comparisons need not be confined to sets in the same price-class. The 6-D is the equal, in every detail, of many receivers priced $25, $50 and even $75 higher.

Performance of the highest order strikingly attractive appearance and moderate price—all these elements of true worth are found in the 6-D

You will note its clarity and the full, generous volume. You will also observe the unusual sharpness of tuning. And the finely carved, high finish mahogany cabinet will make a strong appeal.

Price $125.00
without accessories

EISEMANN MAGNETO CORPORATION

General Offices: 165 Broadway, New York

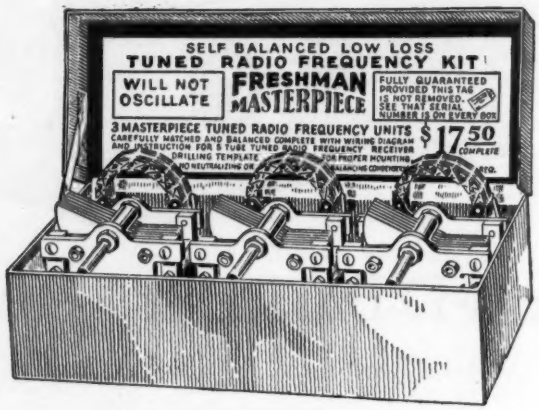
DETROIT SAN FRANCISCO CHICAGO

"Quality Goods for Quality Readers"

FRESHMAN MASTERPIECE

It's Easy to Build

a five tube radio frequency receiver when you use the Freshman Masterpiece Kit


SELF BALANCED LOW LOSS
TUNED RADIO FREQUENCY KIT
WILL NOT OSCILLATE
FRESHMAN MASTERPIECE
FULLY GUARANTEED PROVIDED THIS TAG IS NOT REMOVED. SEE THAT SERIAL NUMBER IS ON EVERY COIL
3 MASTERPIECE TUNED RADIO FREQUENCY UNITS
$17.50 COMPLETE

No Neutralizing or Balancing Condensers Required

when you build with this kit to produce a radio frequency receiver that will bring in even the most distant stations with the volume and clarity of locals. So selective that stations can be brought in day after day at the same dial settings. A set that will be the equal, if not the superior, to any 5 tube receiver on the market, and what's more, it's the easiest set in the world to operate.

Kit consists of 3 Masterpiece Tuned Radio Frequency Units carefully matched and balanced. Complete with wiring diagram and instructions for building any 5 tube tuned radio frequency receiver and also drilling template for proper mounting. . . .

$17.50

Each and every Freshman Masterpiece Coil bears a serial number and Trademark—our guarantee of electrical and mechanical perfection. Every genuine Freshman Coil is made of specially insulated wire to prevent short-circuiting, so often caused by inferior coils. For your protection demand only the genuine. At your dealers, otherwise send purchase price and you will be supplied without further charge.

CHAS. FRESHMAN CO., INC., 106 Seventh Ave., New York

REDUCE STATIC

Pat. Pending 690459

by using our super-sensitive **Omni-Directional Aerial**

Collapsible, Ornamental, Mechanically Perfect

Can be used either as a loop or antenna inside or outside.

A wonderful value featured at a price within the range of all.

Ask your dealer or send order direct

$10.00 Prepaid in U. S.

The Portable Globe Aerial Co. 1682 Locust Dept. 67 St. Louis

RADIO CATALOG Crammed full of Biggest Bargains in Sets, Parts and Accessories—

100 Live Pages

Contains interesting explanation of marvelous benefits of Radio which you may enjoy—told in language anyone can understand. You should get it before buying.

FREE

Everything you may need to build or equip any set. Satisfaction or your money back.

Don't Delay! Send for it TODAY!

Liberty M. O. House, Dept. 7NZ 106 Liberty St., N.Y.C.

Make $100 Weekly selling RADIO

Demonstrate once—results mean sure sale. Coast to coast, lowest prices, attractive four-tube instrument $39.50. Big commission to you. Exclusive territory to proven salesman. Territory going fast, write today for large illustrated book No. 100. Don't fail to give name of your county.

OZARKA, INC.
822 Washington Blvd., Chicago, Ill.

DEALERS WRITE FOR QUICK SELLING

KITS

RADIO PARTS

WHOLESALE ONLY

HAROLD M. SCHWAB, INC.
55 VESEY ST., DEPT. WAN
NEW YORK CITY, N. Y.

"Quality Goods for Quality Readers"

The Plunketteers

(*Continued from page* 78)

tion of the remarkably high caliber of the Strand orchestration.

Another singer who will appear on the Strand program in December is Estelle Carey, soprano, who is the only woman to have ever been adopted by the Newspaper Club of New York. She sang there during the Democratic Convention and so completely won the hearts of the newspaper men that they nicknamed her, "The Little Brown Thrush of Broadway." Miss Carey sang her way down from Canada and into the hearts of the Strand audiences, whom she has been entertaining for the last two years.

"A radio program," says Mr. Edouarde, "must be balanced, just as must a concert program. The trouble with the majority of radio programs is that they are not sufficiently diversified. Too much of the same kind of music is given, whereas we should appeal to the taste of all. Anyone who has watched the development of music on Broadway in the last ten years, must be amazed at the progress it has made. When we started at the Strand, we hardly dared even announce an orchestra. Today, the audiences are really receptive of new things. We watch them carefully, of course, and when we find that the innovation is not welcomed we do not repeat it again until later. When you reflect that this year the Strand sold its sixty-second millionth ticket, you have some idea of the number of people who have been educated up to good music in this playhouse.

"You must understand, too, that the audiences of today know when a thing is sloppily played. We repeat our best numbers until the public is entirely familiar with them and if we are not up to the mark in our rendition of a number, it immediately makes itself evident in the applause.

"Therefore, the concert programs that go out from the studio under Mr. Plunkett's direction, will be carefully played with a varied appeal, with a skilful adjustment of new and old compositions and with the same desire to please and to educate which has been the Strand policy for the past ten years."

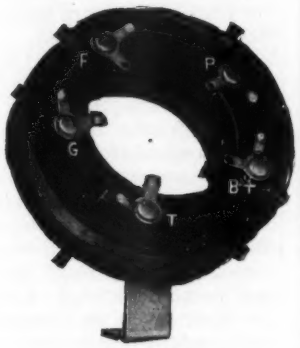
My Happy Radio Career

(*Continued from page* 30)

just jogging along in this fashion, when I received an important telephone call, followed by a visit, from one of the men who promoted WLAG, the Twin City radio station. They had gone to various club women for suggestions as to a director for the station, and my name had been mentioned. As they were in a hurry to open the station, they gave me twelve hours to make a decision. I took it, agreeing to work three hours a day. After six

IT'S HERE!

The New Kellogg R. F. Transformer That Brings 'Em In!



No. 1602

A radio-frequency transformer of the aperiodic type suitable for all sets with which tuned radio-frequency is desired. Also used for one stage of audio-frequency amplification ahead of regenerative sets to prevent re-radiation.

Consider these points of superiority—

No dope to hold windings in place.
Soldered connections.
Mounting bracket holds coil at correct angle.
Minimum rubber used in form.
Lowest possible loss.
Works with any .0005 condenser.
Secondary arranged with suitable taps for biasing features.

This transformer makes the construction of a radio-frequency set an easy matter, assuring best possible reception with widely varying types of circuits, including reflex.

Built and guaranteed by Kellogg Switchboard and Supply Company.

No. 602 Transformer at your dealer's for $2.35 each. Use—Is The Test.

KELLOGG SWITCHBOARD & SUPPLY CO.

1066 W. Adams St., Chicago, Ill.

EDSON Will Allow You $4.00 for Your Old Headset

Faithfully reproduces the lowest and highest tone signals that come in on your receiving set. Fully guaranteed. Regular price $8.50. SPECIAL INTRODUCTORY PRICE WITH COUPON, $4.50, including phone plug.

Another Edson achievement—the creation of a 4000-Ohm Edson Super DX Phone—enables us to make a most unusual offer.

SPECIAL OFFER: We will allow you $4.00 each on your old headsets—regardless of age, make, or condition—to apply on the purchase price of from one to four $8.50 Edson Super DX 4000-Ohm Headsets. YOU SAVE $4.00 on each phone ordered by using the Special EXCHANGE COUPON below. Limit: four phones to a family at special introductory price. Simply mark your name and address plainly on the package containing your old headsets and send remittance by Money Order or Registered Mail, enclosing coupon below. Act quickly; quantity limited.

Dealers: Write for our wonderful selling plan.

Special EXCHANGE COUPON

This coupon and your old headsets entitle you to an allowance of $4.00 each on from one to four 4000-Ohm Super DX Phones, valued at $8.50 each. You pay only $4.50 for each phone ordered.

(WA-12)

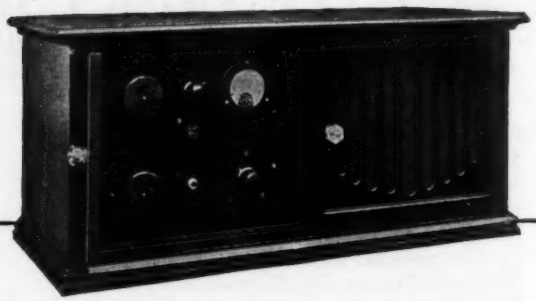
EDSON RADIO SALES CO.

ELMWOOD PROVIDENCE, R. I.

"Quality Goods for Quality Readers"

BAKELITE

TRADE MARK REG. U. S. PAT. OFF.



K. & C. DeLuxe *and* Bakelite

For clear radio reception, reliable insulation is essential. That is why the Kilbourne & Clark Mfg. Co. uses Bakelite—radio's premier insulation—for this K. & C. De Luxe receiving set.

Manufacturers who use Bakelite insulation guarantee good results from their radio sets. Amateurs will do well to profit by the experience of these radio experts and use Bakelite when building their own sets.

Send for Our Radio Map

The Bakelite Radio Map lists the call letters, wave-length and location of every broadcasting station in the world. Enclose 10 cents to cover the cost and we will send you this map. Address Map Department.

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Write for our Booklet "A."

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THE MATERIAL OF A THOUSAND USES

FARAWAY RADIO

$29.50
Gets stations Far and near Loud and Clear

FARAWAY Radio Sets are amazing values at bargain prices. Users get stations from New York to Frisco—loud and clear. Operate with either dry cells or storage batteries. Beautiful cabinet finished in mahogany with new platinum-finished panel. SATISFACTION GUARANTEED. Don't pay $100 to $150. Write for our *money-saving plan* and literature.

2-Tube Set - $29.50
4-Tube Set - 59.50

Dealers - Agents: Biggest possibilities you ever heard of. Write for plan and territory quickly.

THE FARAWAY RADIO CO., 650 W. THIRD ST., CINCINNATI, O.

TELEGRAPH AND RADIO INSTRUMENTS

FRAME CONNECTION
No. 9007.

Open circuit Keys are recommended when it is desired to have two way communication between points without the use of closed circuit batteries.
Other types carried in stock.
No. 9037 Legless Key, Polished Brass Body.....6.00
No. 9035 Leg Key, Polished Brass Body..... 5.50

Send stamps for Telegraph Manual 43-W.
Special Price to Dealers.

J. H. BUNNELL & CO. 32 Park Place, N. Y.

"Quality Goods for Quality Readers"

weeks, I was there three-quarters of the time. By the end of that year, I had plunged in, severed my connections with the church at which I had been singing, obtained a leave of absence from the MacPhail School of Music, where I was a member of the faculty, and was thoroughly enjoying the life of excitement which any broadcasting station develops.

I have never enjoyed any work as much as I am enjoying my present occupation. As I look back, I feel that every influence in my life, from the first stamp of my foot, and "Me *won't*," to the present time—has fitted me for what I am doing. My singing and successful control of audiences has certainly made me sensitive to the public pulse. My fondness for literature, for domestic science, for music, has certainly given me a sense of balance, and made it possible for me to appreciate any kind of a program, so long as it it good; from jazz to symphonies, from grain markets to lectures. I like it all, but not too much of any one thing.

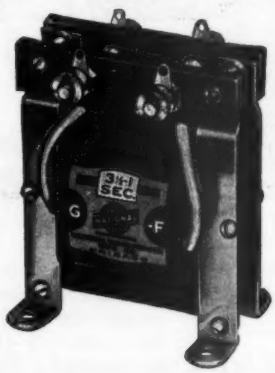
I am fond of every club I belong to, but the older I grow, the more convinced I am, that if women would wait until their lives were partly lived, they would bring a richness of experience and balance into their club work with and for other women.

Appliances and Devices

(*Continued from page* 79)

The National Transformer

THE National Transformer Mfg. Co, Chicago, has made several additions to its line of radio transformers. Now there is a National Transformer to meet different



radio requirements. A distinctive departure from the common practice has been followed in naming the new transformers. Each is called after some type of battleship, because of some characteristic common to the transformer and the type of battleship after which it is named.

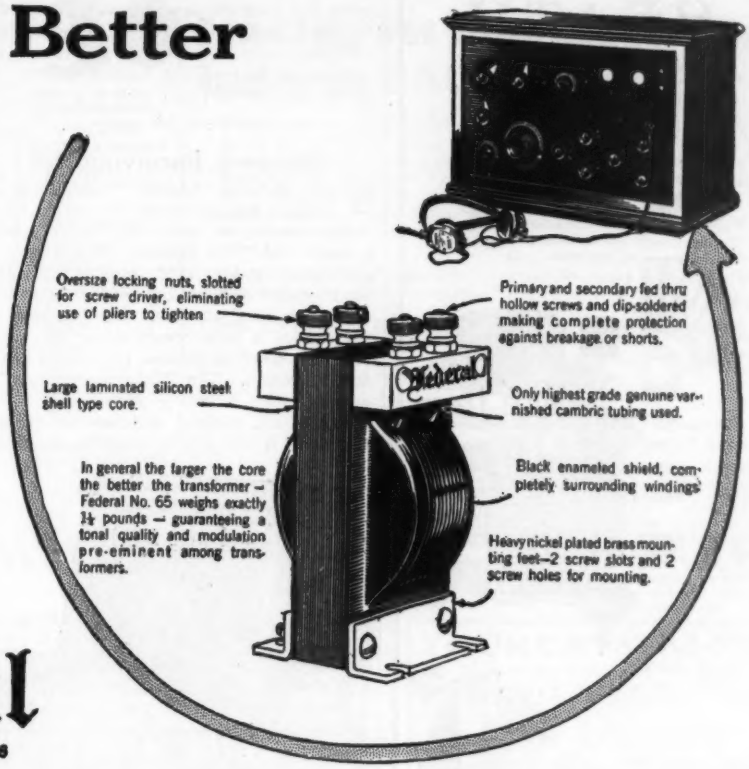
The National U-Type Transformer, for example, resembles the U-boat in that it has been stripped of all superfluous rigging in the way of an outer case and the like. However, the function of the transformer is in

Why it is Better

"MASTER of Every Note in the Orchestral Range" is the proven claim of the Federal No. 65 Audio Frequency Transformer! Volume without distortion is the basis for the beauty of Federal Tone.

From its oversize locking nuts to its heavy brass mounting feet the Federal No. 65 Transformer incorporates the same engineering skill that has made Federal the recognized leader in electrical communication apparatus since 1890.

Insist upon Federal parts for your "pet" hook-up. There are over 130 standard parts bearing the Federal iron-clad performance guarantee.


Oversize locking nuts, slotted for screw driver, eliminating use of pliers to tighten
Large laminated silicon steel shell type core.
In general the larger the core the better the transformer — Federal No. 65 weighs exactly 3½ pounds — guaranteeing a tonal quality and modulation pre-eminent among transformers.
Primary and secondary fed thru hollow screws and dip-soldered making complete protection against breakage or shorts.
Only highest grade genuine varnished cambric tubing used.
Black enameled shield, completely surrounding windings
Heavy nickel plated brass mounting feet—2 screw slots and 2 screw holes for mounting.
Federal

FEDERAL TELEPHONE & TELEGRAPH CO.
Buffalo, N. Y.
Boston New York Philadelphia
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Bridgeburg, Canada

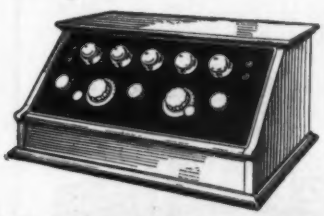
Federal
Standard RADIO Products

CONTINENTAL

"New York's Leading Radio House"

THE SYMBOL OF SERVICE

Quality has kept them foremost



SUCH radio receivers as the Crosley Newport Trirdyne and the Kennedy Model XV have maintained their popularity not only because they combine the three essentials of radio, efficient performance, attractive appearance and moderate price, but because they are receivers of real quality.

Quality or the ability to stand up under constant use helps greatly in satisfying your customers. You can sell your customers on the quality of these two receivers and feel sure that the manufacturers back of these sets have given the best that experience can build.

You don't have to push them—just show them—then watch your profits increase.

2067-Q

CONTINENTAL RADIO & ELECTRIC CORPN.

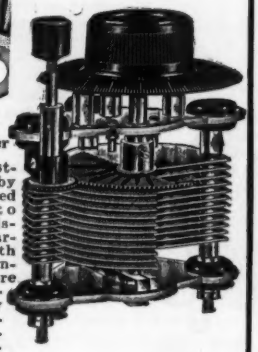
15 Warren Street New York, U. S. A.

"Quality Goods for Quality Readers"

HEATH

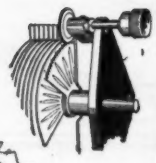
Permanently FLAT plates

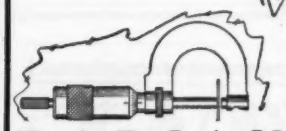
The well known Heath process of stamping rotor plates to lasting flatness makes the new Heath a permanently satisfactory instrument.



Micrometer Geared Vernier

Ordinary adjustments reduced by separate geared adjustment to hair-breadth distinction. We guarantee the Heath Vernier Condenser to be more highly selective than any condenser employing a vernier which actuates ALL of the plates.





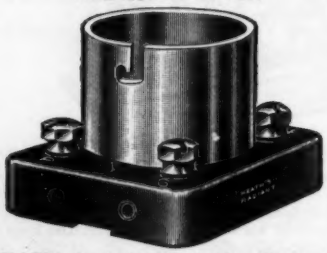
RADIANT— Non-Dielectric CONDENSERS

A new type of end plate which banishes leakage and capacity effects, added to the popular Heath features of permanently FLAT Plates and the most perfect type of vernier. These advantages of Heath condensers are the best guarantee of lasting satisfaction.

PRICES FOR VERNIER CONDENSERS

	With Dial	Without Dial
No. 12 AV 12 Plate...	$5.00	$4.35
No. 24 AV 24 Plate...	5.50	4.85
No. 44 AV 44 Plate...	6.50	5.85

Plain types in all sizes



HEATH Sockets With the Exclusive Shock Absorber Feature

Bakelite base into which re-inforced phosphor bronze, self cleaning contacts are securely embedded. Binding posts are slotted hexagon nuts. HEATH Standards of material and workmanship.....Price 75c

Heath Bakelite dials in three sizes

HEATH RADIO & ELECTRIC MFG. CO.
203 FIRST ST. NEWARK, N. J.

Exclusive Canadian Distributors
Marconi Wireless Telegraph Co., Ltd.,
Montreal, Canada

no way impaired, though the price is somewhat less than the same transformer would be if the cost of the case and the extra assembling were added. The U-Type is an audio-frequency of the highest quality. It comes in either 3½ to 1 or 6 to 1 ratio.

Mohawk Receiving Set

THE Mohawk Electric Corporation of Chicago, has just placed on the market a radio receiving set which can be tuned with a single dial. The Mahawk set will tune in one distant station after another with full loud speaker volume and without interference from local stations. The clearness of tone gives a new meaning to the word "radio." Unusual volume is obtained without distortion. The Mohawk set can be operated with a long or short aerial, or no aerial at all, without making any adjustments and it will give excellent results under

varying conditions. Stations once found and logged will always come in at the same point on the single dial.

The Mohawk set uses five tubes. The circuit has two stages of radio-frequency amplification, a detector and two stages of audio amplification, and is an improved modification of the tuned radio-frequency principle. Synchronized condensers and perfectly balanced transformers eliminate distortion. The wave length range is from 150 to 650 meters. Shock absorbing genuine bakelite sockets and a bakelite panel are used in all models.

The period cabinet shown in the illustration is the "table" type. Other models are the "console" type, which includes a loud speaker and room for A and B batteries and the "consolette" type, which has the loud speaker as an integral part of the cabinet and has space for the B-battery. All cabinets are of piano construction, five-ply, with mahogany veneer and are finished in two-tone Adam brown mahogany, hand rubbed. All connections are made in the rear of the cabinet.

Durham Variable Grid Leak

THE Durham Variable Grid Leak permits control of the grid resistance, which materially assists in bringing in distant stations

more clearly and cuts out "mush." Just a touch of the plunger in or out, as may be required, clears up the signals and enables your tube to operate at its highest point of efficiency. Minimum grid leak resistance is obtained with the plunger all the way in and maximum resistance with the plunger all the way out.

MARLE

TRADE MARK
REG. U. S. PAT. OFF.

Radio & Audio Frequency

TRANSFORMERS

Buy One Now
Prices $3.00
up to $6.00

MARLE ENGINEERING CO.
ORANGE, NEW JERSEY

IF you could make a comparison *capacity test* of our noiseless mica condensers,— as many leading set manufacturers have done,—you likewise would ever after insist on

NEW YORK COIL CO'S.
338 Pearl Street, New York City

The best switch made and it LOCKS *your set, too!*

DON'T worry any more about someone meddling with your radio set while you are away. Simply remove key from Walbert Filament Lock Switch and take it with you just as you'd take the ignition key from an auto. Sturdy, compact, efficient. Shell and key handle insulated from circuit. No finer switch, and none made with unique lock feature. Extra key with special key ring attachment, 20c.

50c.

At your dealer or sent postpaid on receipt of purchase price.
(Please mention dealer's name.)

Jobbers and Dealers: Write for Discounts
THE WALBERT MANUFACTURING CO.
925 Wrightwood Avenue Chicago, Ill.

WALBERT FILAMENT LOCK SWITCH
Safeguards Tubes and Batteries

It will fit the standard grid leak condenser base such as the Dubilier. It does not require special drilling of panels although a quarter inch hole drilled through your panel will enable you to operate the plunger directly from the panel front if you so desire.

The Durham Variable Grid Leak may be used in practically any standard set by replacing your present type of fixed leak.

The Radio Lyre

(*Continued from page* 49)

there is no tendency toward resonance or distortion when resistance coupling is used for audio frequency amplification.

There has been much discussion as to the relative merits of resistance and transformer coupled amplification. It cannot be denied that transformers are more efficient, for the inductive relation of the windings steps up the input to each succeeding tube. With resistance coupling, it is only the varying voltage drop across the plate resistance that actuates the grid of the next tube. The amplification per stage, therefore, is simply the amplification factor of the tube. The redeeming virtue of resistance coupling is its faithful tone reproduction.

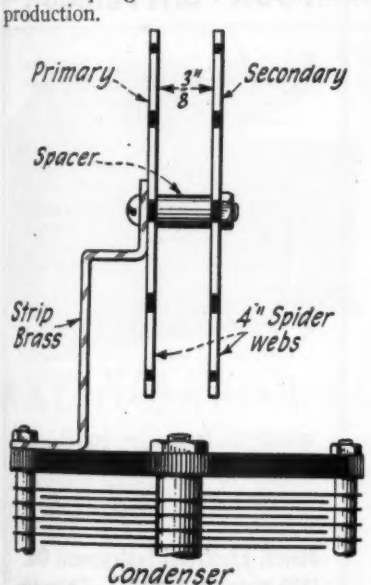


Figure 2—The spiderweb antenna coupler is mounted on the variable condenser by means of strip brass

Three stages of resistance-coupled amplification following a standard one-tube crystal reflex will provide all the volume any one could ask, with a quality of tone that will please the most temperamental artist.

The antenna coupler consists of an untuned primary closely coupled to a tuned secondary. The primary, P, consists of 10 turns of No. 18 DCC, wound on a 4-inch spiderweb form. It is more convenient to wind the heavy wire over and under two arms of the web instead of one. The secondary contains 50 turns of No. 28 DCC, wound in the usual manner on a 4-inch

30 leading set manufacturers indorse PACENT quality

PACENT Radio Essentials

Adapters
Improved Audiotormer
Audiphog
Baloon
Coil Plug
Coil Plug Receptacle
Condensers
Detector Stand
Duojack
Duoplug
Duo-Lateral Coils
Headsets, Everyfone
Jacks
Jack Set
Radiotap
Loop Plug
Loop Jack
Multijack
Plugs
Potentiometers
Rheostats
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DEALERS SAVE MONEY
By Ordering from Our Bargain Catalog of Nationally Advertised Radio Goods. Write for It Today.
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YOUR CRYSTAL SET
will work 400 to 1,000 miles if made by my plans. No tubes or batteries. Copyrighted plans $1.00. Satisfied customers everywhere. Particulars free.
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Sweeter Christmas Carols On Your Radio

$10 Complete With Cord

RHAMSTINE★ Needlephone

This illustrates the "magnified reproduction" principle of Rhamstine* Needlephone. The delicate vibrations of the reed at "C" are transmitted through the pivoted needle and magnified at "A."

When the sweet, tender strains of "Silent Night, Holy Night" broadcast by some cathedral choir come in over your radio Christmas Eve, you will want a Rhamstine* Needlephone to enjoy it to the fullest.

RHAMSTINE★ Needlephone

Nothing else will give the same mellow notes, the same discrimination of tone values, the same perfect reproduction because no other loudspeaker takes advantage of the "magnified reproduction" principle and the correct principle of acoustics (the laws of sound) as embodied in the phonograph reproducer.

The Needlephone gives all the advantages of the phonograph without even removing the needle. It has no metal diaphragm so it cannot produce metallic noises. It is more easily attached, requires no extra equipment, and can be used on any phonograph including the Edison with Victor adapter.

PAY NO MONEY TAKE NO RISK

Send the coupon today, pay on delivery, and try the Needlephone with your own set and your own phonograph. Try it with a soft needle on local broadcasting and see what pleasures await you. Try it with a loud needle and enjoy greater volume without metallic noises. Then, if you are not entirely satisfied, if you cannot say you get better reproduction, return it and Rhamstine* will refund your money.

Send this coupon today—there will be lots of things on the air that you will want to hear this Christmas.

J. Thos. RHAMSTINE★

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Send me the Needlephone. I'll pay the postman $10 upon its arrival. It is distinctly understood I may return it if I desire, within 5 days, and receive a refund in full.

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spiderweb form. The outer terminal of the primary connects to the ground, and the inner to the antenna. The outer terminal of the secondary is connected to the stationary plates of the variable condenser, and to the grid; the inner post is connected to the rotating plates.

After a number of trials, it was found that the coils should be spaced approximately ⅜-inch from each other. This will provide a maximum of sensitivity and selectivity. They may be conveniently spaced by cutting a small rubber eraser to the right size, putting a hole through it large enough to pass a No. 8 machine screw. The coupler is then mounted on the variable condenser by means of a piece of strip brass, as shown in figure 2. The radio frequency transformer, RFT, may be any good make, designed to cover the wave length band of 200 to 550 meters. The audio frequency transformer should be a low ratio standard make to insure the best results.

The picture of the completed receiver shows how the parts were assembled and mounted. The two Sear-de aluminum brackets, which may be purchased at any radio store, are drilled to pass the rheostat mounting screws. The sub-panel is drilled to mount the sockets, transformers, resisto-couplers and binding posts, and mounted on the aluminum brackets by machine screws. The parts are then mounted on the sub-panel, making a very neat and easily wired layout.

Filament control jacks are used to simplify the operation of the set.

The plate resistances, Ra, Rb and Rc, are 100,000 ohms each. The grid leaks Rm, Rn and Ro are 2 meg., 1 meg., and .5 meg. respectively. The resistances, leaks and grid condensers are very easily mounted and wired if Daven resistance coupling parts are used.

The heart of the set is the crystal detector. Many builders of crystal reflex sets do not get good results because of a poor detector. An adjustable, semi-fixed detector is by far the best. The writer found a silicon crystal to be the most efficient. The set described herein has been in use several months, and not a single adjustment has been made on the crystal since its initial setting.

With a 90-volt B-battery, the effective plate potential is about 75 volts. A 3-volt biasing or C-battery should be used to cut down the B-battery drain.

The completed receiver is extremely simple to operate. The filament control jacks eliminate switches. All the operator needs to do is to plug in the loudspeaker in the proper jack, and turn the dial to bring in the desired station. The tone quality, the simplicity and quietness of operation of this set makes it possible without any undue straining of our imagination to nominate it "The Radio Lyre."

JEWELL

"A" and "B" Battery Double Range Voltmeter No. 57 7½ and 150 Volts, $10.50

WATCH — YOUR BATTERIES!

¶ Run-down and poor batteries cause more radio grief than poor tubes, static and all other sources of trouble combined.

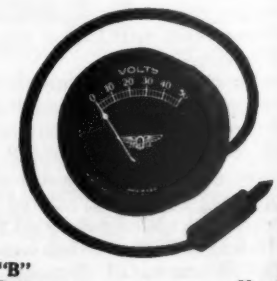
¶ Reliable dealers are now testing batteries—on the counter—before your eyes—before selling them to you. They are using a Jewell No. 57 Semi-Portable Double Range Voltmeter for this service.

¶ This same instrument is being used by set owners for frequent testing of "A" and "B" batteries. It is very accurate.

¶ Ask your dealer. Buy from your dealer. Every radio "fan," "bug" or "nut" should have our 15-A Radio Catalog.

Jewell Electrical Instrument Co.
1650 Walnut Street — Chicago
U. S. A.

25 Years Making Good Instruments



"B" Battery Voltmeter **No. 84 $2.75**

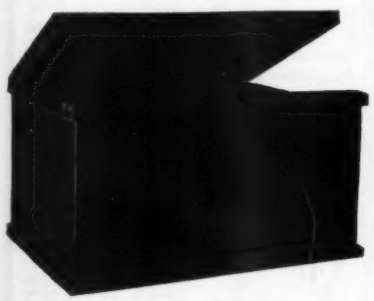
The Night Before Xmas

(*Continued from page 36*)

New York!' Posh!" Old pappy couldn't be persuaded—he had quit "believing in Santa Claus" in the modern way—and he was pathetically out-of-date in consequence.

A "radio Christmas" is a perfectly harmonious combination; twin makers of joy in the home, in fact. How delightfully they go together is illustrated by a little Christmas radio stunt which we pulled off at a recent Christmas. At the very tip of the tree, we placed a large colored chromo of Santa Claus and just beside it a small loud speaker horn. Then we ran concealed wires down from this horn to the radio set, placed in another room. I won't give the technical directions here, because I'm no radio expert, but any radio handy man can tell how to do it. Connect your telephone so that you can amplify your own voice through the loud speaker of your own radio set. The speaker in another room can make his voice come out, amplified, from the

(*Turn to page 88*)



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Strong and Rigid

Remember that we pay mail and express charges — it makes quite a difference when comparing prices.

Specifications

Hardwood, rubbed mahogany finish. Top hinged, ends of top splined to prevent warping.

Panel size	Depth	Price
7x14	10	$3.00
7x18	10	3.25
7x21	10	3.50
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7x27	9	5.00
7x28	10	6.00

Mail and express prepaid East of the Mississippi River.

We also make Radio Desks and Tables.

Send for free catalogue.

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NEUTRODYNE
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Made by The GAROD Corporation
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ZENITH Super-Portable
A six-tube radio set, completely self-contained. Does not need to be opened to operate. Write today for full particulars and name of nearest dealer.
ZENITH RADIO CORPORATION
McCormick Building, Chicago

Famous Frank 8-Tube Radio SuperKit

Makes the Continent your Playground!

$85.00

Just think of it, every broadcasting station in the country within your reach. Wonderful **results** from near and far—New York, Chicago, San Francisco, New Orleans, all come to you—easily, quickly, beautifully clear.

This wonderful 8-tube super heterodyne is the **greatest radio receiver in the world.** The most amazing value ever offered in RADIO. Black or mahogany panel finish, can be mounted on 7x26 inch standard, or fitted in cabinet. Makes a beautiful appearance, worthy of any home. All material the finest obtainable, workmanship that will stand any test. This set will last for years and give **perfect satisfaction.**

Any beginner can assemble it properly. Diagrams absolutely self-explanatory. Book of directions easy to follow. You can build the set in very short time, and enjoy doing it.

Every part in this kit has been thoroughly tested in the factory. All parts are perfectly adjusted to fit as shown in the diagram. Our guarantee protects you against parts injured or broken in shipment. New parts will be sent to you upon receipt of defective units.

Consists of

1—Drilled and engraved panel 7" x 26"
3—Frank Intermediate Transformers
1—Frank Input Tuner
1—Frank Input Transformer
2—Triple Panel mounting sockets
1—Jewell 0-8 volt voltmeter
3—Base mount sockets
2—.0005 variable condensers
2—10 ohm rheostats
1—30 ohm rheostat
1—Potentiometer
1—A Battery Switch
2—Single closed jacks
1—Single filament control jack
2—.005 fixed condensers
1—.002 fixed condenser
1—.5 fixed condenser
2—.00025 fixed condensers with leak mounts
2—Grid leaks
2—Audio Transformers
1—Baseboard
2—Dials
2—Dial vernier controls
2—Binding Post Strips
All necessary bus bar, spaghetti and hardware
Self Explanatory Wiring Diagram

Fada 5-Tube Neutrodyne Kit $69.50

Finest 5-tube Neutrodyne set in the world. Wonderful tone production, sharp tuning and 3,000 mile range.

- 3 Fada Neutroformers
- 1 Triple Socket Panel Mt.
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- 3 Fada Single Sockets
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- (2) .006 Micador Cord
- (1) .00025 Micador Cord
- 1 Grid leak
- (2) Bakelite Rheostats
- 1 C. H. Battery Switch
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- 14 Lengths Bus Wire Spaghetti and wiring blueprint baseboard
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You Must be Satisfied!

SEND NO MONEY AT ALL

Just fill in the coupon and then pay the express man when he delivers it. Try it in your home for two weeks. If it is not all and more than we claim, return it and get your money back. You get the complete kit for $85.00, plus the small express charge.

Perfection Radio Corp., Dept. BB., 78 Cortlandt St., New York.

Send me the kit I have checked, with the understanding that I can try it in my home for two weeks. If it is not all that I expect, I can return it and get my money back.

8 tube heterodyne — black finish mahogany finish

Name .....

Address .....

"Quality Goods for Quality Readers"

Engineers developed this special panel material for radio ONLY

THERE is nothing quite like Radion — "the supreme insulation"—for real results. The Bureau of Standard tests conclusively prove highest insulating characteristics. In the set you build, it will give you just that extra energy needed to tune in the distant stations. When you see Radion in a ready-built set, it is an evidence of general good quality in that set.

You can see the difference between Radion and common panel materials, if you will look at the finish. Radion has a high, polished finish. That keeps out dirt and moisture, which even in little particles on the surface, cause short circuits and reduce good reception. Look at Radion and other panels under a magnifying glass, if you can.

Everyone knows Radion is the easiest panel material to drill, cut and saw. There are eighteen stock sizes, two colors, black and mahoganite. Sold universally by dealers who know radio. Better performance will make it worth your while to ask for it by name, and to look for the name on the envelope, and the stamp on the panel.

Radion dials to match, also sockets, binding post panels, insulators, knobs, and new Radion built-in horn.

Send for booklet

Mail coupon below for our catalog and booklet, "Some Insulation Stickers Explained."

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Please send me your catalog and booklet, "Some Insulation Stickers Explained."
Name .....
Address .....
City ..... State .....

The Night Before Xmas

(*Continued from page* 87)

loud speaker on the top of the Christmas tree.

You can imagine what wild excitement there was among the children, when on Christmas morning, Santa Claus appeared to be speaking to the children from the top of the tree. The things he knew about the children as he called them all by name, left them aghast. That loud speaker became the most vivid part of our Christmas, for we not only used it to beguile the children, but to mystify our guests, and to add fun to our annual Christmas party.

I recommend to everyone with a three-tube or larger set who have children in the home, that they add this to their Christmas bag of tricks, for it is certainly a thriller, and it can be made to provide no end of surprises. I know of one family who made up a snow image of Santa Claus and put the loud speaker in its mouth; another dressed and fitted up a Santa Claus dummy, life size. This might be a good idea for a Sunday School Christmas party.

If you agree with me that radio is enchantingly intertwined with the Christmas spirit, you can carry this out to a slight extent even on your Christmas table. I have herewith supplied a special Christmas menu, which is as delicious as any you might conceive. It will, perhaps, appeal to enough readers of WIRELESS AGE, to make it a special radio-broadcast Christmas dinner, especially enjoyable in the knowledge that thousands of other radio loving families will also eat this dinner. I have varied the *pièce de résistance* from turkey to goose, to be a little different. We will dare to call it a national radio Christmas dinner. Radio is something of a gosling itself, being as yet in a developing stage!

If you are a rabid radio fan you might, to carry out the idea of a radio Christmas, seat at the table with you a life-sized stuffed dummy of Santa, rigged up with the loud-speaker scheme above mentioned, and have him conduct a conversation; someone in another room doing the "broadcasting."

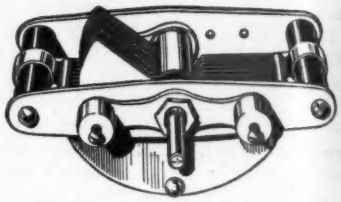
There is an infinite variety of opportunity to have fun with radio, and at Christmas time there is more than ever.

CHRISTMAS DINNER

Scallop cocktail
Celery stalks stuffed with peanut butter
Olives
Consommé
Roast gosling Mt. Vernon apples

Lincoln RADIO PRODUCTS

Low-Loss Condenser



Improves Any Set!

Manufacturers of the finest radio sets are using the 23 plate Lincoln Low-Loss Condenser. For they know, after countless tests, that it will improve any set. Increases range of reception, selectivity, and volume. Most efficient electrically — strongest mechanically—due to several radical improvements. Minimum capacity extremely low. Two well-known laboratories found this condenser to have a lower high frequency resistance than any other condenser of this type. A complete die-cast job, rugged in construction and fully guaranteed. Sold by leading dealers. If yours cannot supply you, order direct giving dealer's name. Price $4.50.

Write for Catalog

Fully describes all Lincoln Laboratory Tested and Guaranteed products — Lincoln Low-Loss Condenser, Lincoln Collapsible Loops, Lincoln "Long 45" Tuner, Lincoln Kit, Lincoln Oscillascope—and shows 6 interesting hook-ups. Send your name and your dealer's name for a copy.

Lincoln Radio Corporation
224 North Wells Street, Chicago

The Standard of the World

The base-type
Freshman Variable Grid Leak
is the standard for those who build their own sets. It is the most compact and being entirely sealed it always remains unaffected by any climatic conditions.
Complete with either .00025 or .0005 Freshman Condenser— without condenser..... .75 **$1.00**
At your dealer's, otherwise send purchase price and you will be supplied postpaid
Chas. Freshman Company, Inc.
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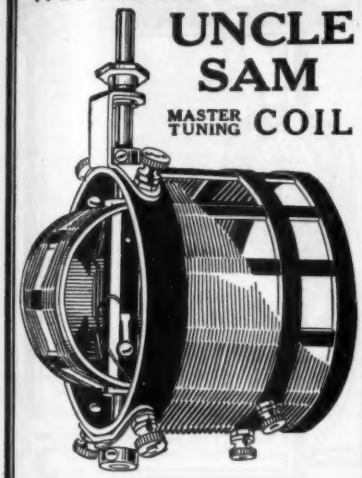
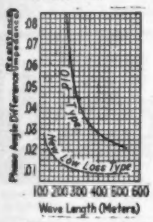
THE COIL
WITHOUT LOSSES
UNCLE SAM
MASTER TUNING COIL



A few features of the greatest inductance in the world—

1. Wound on moulded hard rubber.
2. The only coil wound with the wonderful Ambassador Litz wire.
3. Eliminates all adhesives.
4. Has a one hole mount and thin gold plated compensating spring contacts.



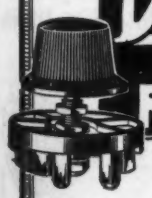
Laboratory tests prove conclusively that it is the only coil worthy of the name Low Loss.

When you build a set with this coil you build your final set.

FREE! Ask your dealer or send self-addressed stamped envelope for wiring diagrams of circuits in which this coil can be used.

UNCLE SAM ELECTRIC CO.
208 E. Sixth St. Plainfield, N. J.

DeJUR
ONE HOLE
RHEOSTAT



You can put this rheostat on your set in less than five minutes. It has everything — fine, clean-cut appearance, will wear for years, and is designed for maximum efficiency.

Consider these exclusive points: Non-corrosive, heat resisting, absolute contact by sliding rod on slide arm, interchangeable resistance element.

Guaranteed—any part replaced at any time. Sold everywhere.

Jobbers and Dealers Write for Discounts

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Lafayette & Broome St., New York

Scalloped potatoes
Brussels sprouts, sauce piquante
Orange punch
Romaine Roquefort salad
Plum Pudding
Demi-tasse

Roast Gosling: Prepare as usual for roasting. For stuffing use four mashed hot-boiled potatoes, two egg yolks, one very finely-minced onion, two tablespoonfuls butter, salt and white pepper mixed thoroughly. Place in roasting pan, and arrange around it six-cored tart apples, seasoned with salt, pepper and butter. Baste frequently. Arrange gosling on platter with apples around. Skim fat from roasting pan, add one tablespoonful flour, blend and pour on two cups hot water, in which half a glass of currant jelly is dissolved. Pour sauce over apples and gosling and serve.

Mysteries of the Vacuum Tube

(*Continued from page* 51)

minute value of current, it will be best not to include it directly in the set itself, but to provide means for connecting it in the circuit, when it becomes desirable to measure grid current values.

We will now insert the tube to be measured in the socket, which is provided for its reception, and connect the batteries of the proper value for supplying the filament, plate and grid potentials to their respective sets of binding posts. There are several precautions to be observed in connection with these experiments that we are about to make. We must be very careful that there is no faulty condition inside of our tube, such as the grid touching the filament or the grid touching the plate. If the first condition were true and we were using a grid current meter, this meter would be burned out, also if the plate and grid were touching and we were measuring the plate current we would burn out the plate milliammeter. Therefore, the first test should be to place the tube in a circuit and see if it is in an operating condition, and if it functions in any degree at all, we shall be safe to go ahead with our tests. If, however, we get no signals, this is no sign that it is not safe to test the tube, as other conditions within the tube may prevent it from operating, as it has been doing without having parts of the tube actually in contact. However, no attempt is to be made here to discuss the various conditions governing the action of the vacuum tube, but instead we are trying merely to give the general picture of the method of curve taking, so that when in the next article we read concerning tubes from the point of view of their characteristic curves, we will be able to better appreciate the background that has already been prepared for our discussion by the preparation of our tube curves. As a final point, before we go ahead

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514 PAGES

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NO MORE need you turn from book to book, hoping to find what you want. It is all here, in 514 pages crammed full of every possible radio detail. Written in plain language, by engineers for laymen. More than 100,000 sold.

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Check here ☐ *and enclose $1.50 if you wish the de luxe edition, bound in Leatheroid.*

'SHEPCO' ALL WAVE Jr.
Non-Radiating DX COUPLER
nabs those elusive stations and holds 'em!

Wavelengths from 150 to 1,000 meters in single circuit; 150 to 700 meters in triple circuit—the bankwound and tapped primary and tapped secondary do the trick.

6 efficient hook-ups with every coupler or sent for ten cents to cover mailing

At all dealers or sent prepaid on receipt of price... $6

Made and Fully Guaranteed by

SHEPARD-POTTER CO.
Incorporated
Dept. W
33 So. River St. Plattsburg, N. Y.

with the construction of our first curve, a great deal of care must be observed, when varying one value and observing another variable value, to prevent the other values from possible variation, such as plate potential, filament voltage and filament current. Therefore, let us use batteries which will not drop in voltage after a small amount of power has been drawn from them, and let us allow our tube to burn for a short time before we start to take our readings.

We are now ready to go ahead with the taking of a grid potential, plate current characteristic curve of our vacuum tube. By means of the potentiometer in the grid circuit in connection with the grid battery, we will adjust the grid potential, so that the grid is at a maximum negative potential with respect to the filament, and holding it at this point, we will observe the resultant plate current. Now, decreasing the grid potential so that the grid is less negative with respect to the filament, again observe the resultant plate current. We will continue this variation of grid potential until it reaches zero, recording both grid potential and resulting plate current at each setting. We will now adjust the grid potential so that it is slightly positive with respect to the filament and continue this grid potential in a positive direction until we attain such a value that the plate current ceases to increase with an increase in the positive grid potential. We now will have a set of values as represented in figure 8, and by using those values we may construct a curve as per figure 9. As the tube passes energy in one direction only, we will only have positive values of plate potential, but as the values of grid potential are both negative and positive, we will find that the curve will lie in the first and second quadrants of figure 4.

It would be well for the reader to appreciate the fact at this time that, in order to obtain a curve of the greatest degree of accuracy of any one tube, that a single set of readings seldom suffices, but that the experimenter has to make several sets of readings, and then construct a curve, which is an average of these several sets of readings. This article, however, is not intended to give the methods of accurate curve-taking, but more to show the groundwork that has to be performed, in order to have the curves that we will use to study the operation of our tubes.

Now that we have constructed our curves, we are ready to study them for a clearer understanding of the operation of our tubes, and in the next article of this series we will devote our attention to the use of the vacuum tube as a detector for the reception of radio-frequency currents.

Don't Miss a Program

Get a

Valley Battery Charger

Sometime, haven't you wanted to hear a certain radio program . . . but could not because your storage battery was down?

Don't let it happen again. Add a Valley Battery Charger to your radio set, and you can always be ready to listen in. With the Valley Charger you can completely recharge any radio battery at home overnight.

Quiet in operation.
Full 6-ampere charging rate.
No liquids. No bulbs.

The Valley Battery Charger recharges 2-volt peanut tube cells, 6-volt A batteries, and from one to four 24-volt B batteries. Takes about a dime's worth of current for a full charge.

Plugs into the ordinary light socket like a fan or other household necessity, and is just as easy to operate. It has a grained and engraved Bakelite panel which harmonizes with any radio set. Clear glass top shows the simple, patented working parts at all times.

At radio dealers everywhere.

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3157 S. Kingshighway St. Louis, Mo.

The Complete Efficient and Economical Aerial

ANTENELLA

No Aerial or Antenna Needed

$1.25

Why pay $10.00 or more to have an aerial spoil the appearance of your home? Antenella eliminates all unsightly wiring, lightning arresters, etc., and precludes the possibility of dangerous grounding on a power line. It also stops "canary bird" re-radiation from nearby oscillating sets interfering.

ANTENELLA

is not only a real distance getter, but also overcomes troublesome static.

At your Dealer, otherwise send purchase price and you will be supplied postpaid.

Chas. Freshman Co. Inc.
Radio Condenser Products
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Poly Plug

is the only phone plug equipped with the wonderful "tension slot" which permits you to pull and tug the cords all you want and still

Positive contact always maintained

It's Genuine Bakelite, too

At your dealers or by mail on receipt of purchase price

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$40 a Week

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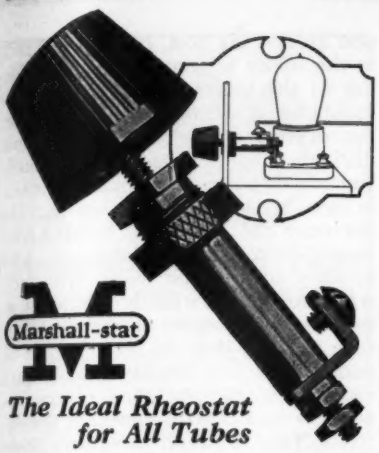

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The Marshall-stat provides a means of obtaining any desired tube adjustment with absolute precision. The Marshall-stat varies the resistance, not step by step, but smoothly, continuously, and uninterruptedly from zero to maximum.

The Marshall-stat provides vernier precision throughout its entire range. Yet there is only one knob to manipulate—no double adjustment to make.

Besides its precision and ease of operation, the Marshall-stat requires only one hole in the panel, has only two terminals, can be used with any tube or combination of tubes, and is so scientifically constructed that breakage of the specially-treated Marshall discsis impossible. Compact—**note full-size cut above.** Can be fitted anywhere. Price $1.75.

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Send for Old Man Ohm's descriptive folder on the Marshall-stat.

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YOU are going to give a "radio party," or you are going on a hunt for "DX." You get yourself set for a "large" evening. Then some little unavoidable thing happens and you blow all your tubes. Money, fun and everything is lost.

This can't happen if your set has a KANT-BLO on it.

Kant-Blo
SWITCH **SIGNAL** BINDING POST
Lights on any Short Circuit

Manufactured by
GANIO-KRAMER CO., Inc. New York

A NECESSITY— NOT AN ACCESSORY

The KANT-BLO is not an extra accessory to your set. It is designed as a B battery Binding Post or as an A battery filament switch. Post Style and Switch Style—are at all the best radio stores. If your dealer is out of stock send us $2 for a KANT-BLO Binding Post Style, or $3 for the Switch Style, and we will ship any number of KANT-BLOS direct to you, charges prepaid.

Sole Distributors
APEX RADIO CO. 503E Fifth Ave.
New York

The DX Go-Getter

(*Continued from page 35*)

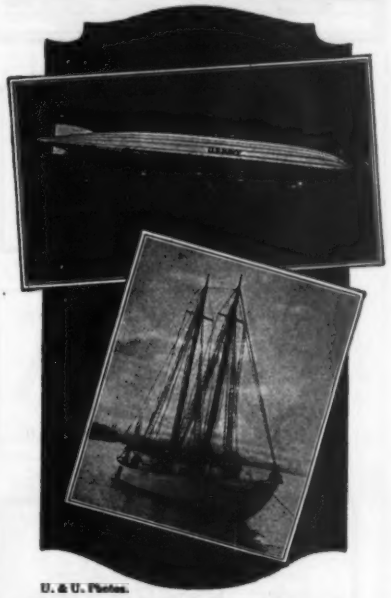
		R. F. Cond.	Det. Cond.
WEBH	Chicago	18¾	19
WHN	New York	17	17¾
WLS	Chicago	13¼	16¼
WBZ	Springfield	12¼	15¼
KDKA	Pittsburgh	11	14
WDAF	Kansas City	26¼	25½
WOR	Newark	22	21¾
WJZ	New York	30¼	30
WCAP	Washington	32¾	32
WEAF	New York	36	36
KYW	Chicago	44	41¾

These were received between 7:30 P. M. and 8:30 P. M. in our laboratory located about a fifth of a mile from WEAF and about 500 yards from WNYC, both 500-watt stations. No interference from either was had at all.

CONSTRUCTION DETAILS

Unless a certain order is followed in wiring this receiver, it is liable to present difficulties to an inexperienced builder. The antenna transformer, the five sockets and the three audio transformers must be mounted along the rear edge of the baseboard, and the binding post strip securely fastened by angle brackets in the center rear of the baseboard. Lay out the panel and drill the holes for the two variable condensers, four rheostats and three jacks. Mount the instruments on the panel, and then lay it aside until all the connections are made on the baseboard that can be made. Start with the filament circuit and run one piece of bus wire from the first socket through the last two. The last two are connected in parallel. This is the positive leg of the filament and is common to all tubes. The rheostats are connected to the negative lead of each tube and should not be connected until the panel is placed on the baseboard. If care is used in wiring this set, the finished set will present a very good looking appearance, but it is not hard to make it the worst looking job you have ever done. Mount the grid condenser on the detector tube directly on a short piece of bus wire extending from the grid binding post to the socket so that your grid lead will be very short. The other side of this condenser then goes to the detector tuning condenser stationary plates in as direct a line as possible. The only long lead on the set is the antenna lead from the antenna transformer to the binding post. This can be obviated by placing the antenna and ground posts on the panel, but it does not present quite so good an appearance. It can be run in a very direct line to the binding posts back of the sockets, and although long can be kept out of contact with other wires. In making connections to the transformers do not trust to a loop connec-

Further Adventures of **BURGESS RADIO BATTERIES**



U. & U. Photos.

The Shenandoah is Equipped with Burgess Batteries and MacMillan Carried them to the Arctic

If the quality of any product may be judged in part by the standing of its users, surely Burgess quality must be considered unusually high.

Burgess Radio Batteries are found where there's need for the most efficient batteries made—in emergencies where failure brings disaster—with explorers in far-off lands—with the unsung heroes of the air service—beneath the seas with the crew of the submarines.

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tion around the post, but solder direct to the solder terminals provided. The use of the Celatsite wire is of great assistance in wiring up the set as the use of this colored wire will permit distinguishing leads and it will be much simpler to trace out your connections in case some of them are wrong. Do not omit the .001 mfd. by-pass condenser across the phone-jack and primary of the first audio frequency transformer. If this is omitted you may tune in a signal on your detector tube and lose it in the second stage of audio. The four Bradleystats used are essential to the operation of the receiver. As a careful control of the detector tube is very necessary, these Bradleystats may be used with any type of tube and, as far as that goes, the set may be operated with any type of tube, but better results are secured from 201-A's throughout, or four 201-A's and a good UV-200 in the detector. No changes are necessary for other tubes other than sockets to fit the tubes. No binding post is shown for the C-battery minus, as this was incorporated in the set proper. It is sometimes more handy to use an external C-battery, so if this is desired, another binding post should be added. The Samson transformers are properly shielded and no ill effects are had from mounting the transformers with their windings parallel, with only a socket intervening. Connect all rheostats to your common negative binding post with one length of bus wire, if possible. This forms the negative return for all grid return leads. In mounting the antenna transformer be sure to mount it so that the plane of its windings is at right angles to the plane of the grid winding on the detector unit as it is quite essential that no interaction take place between these two inductances. 90 volts B-battery is used on both amplifier stages and also in the radio frequency stage. Be sure to by-pass the B-battery and the A-battery with a good mica .006 fixed condenser, such as the Dubilier Micadon, as the radio frequency stage will not function properly without it. Place this condenser as close to the plate coil of the radio frequency tube as is possible.

Operation

Now do not expect to complete this receiver and sit down and tune in POZ or KGO the first time you turn the dials. We do not mean that this receiver is difficult to tune, but it has its peculiarities, and with this simple rule to follow you should have no trouble. Set the antenna coupling coil parallel to the other windings of the coil, so that full coupling is had and set the coupling on the detector unit about one inch out. Now tune the detector tuning condenser and the tickler coil as

U.S. TOOL CONDENSERS
TRADE MARK

The Innovation of the Year

ONE PIECE STATOR
(Pat. Applied for)

An EXCLUSIVE and UNIQUE FEATURE—value immediately recognized by entire radio world. Eliminates broken contacts, soldered joints, leakage and resistance. Found in types 3 (plain) and 4 (all-vernier), **CELORON END PLATES;** Types 5 (plain) and 6 (all-vernier), **METAL END PLATES.**

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4 tube set—with 2 dry cells, 3 Battery, 4 tubes, $57.95
3 tube set—with 1 dry cell, 3 Battery, 3 tubes, $49.95
2 tube set—with 1 dry cell, 3 Battery, 2 tubes, $32.95

The above 3 sets can also be furnished for use with "A" storage battery instead of dry cells. $12.50 extra.

1 tube set—with dry cells, 3 Battery, 1 tube, $19.95

Sets also sold without accessories. Also full line of radio accessories, 1 and 2 stage amplifiers and portable sets. Write for FREE catalogue—*don't buy until you see it.*

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INTRODUCTORY PRICE

For a limited time *only*, and to introduce this new and superior Storage "B" Radio Battery to the Public, we are selling it for $3.50. Regular Retail Price is $5.50. You save $2.00 by ordering NOW. A finer battery cannot be built than the

World Storage "B" Battery
(12 CELLS—24 VOLTS)

To ten million homes with Radio Sets—and to countless millions of prospective buyers—this WORLD Storage "B" Battery brings a new conception of battery economy and performance. Here is a battery that pays for itself in a few weeks—will last for years and can be recharged at a negligible cost. And you save $2.00 by ordering now.

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SEND NO MONEY

Just state number of batteries wanted and we will ship day order is received. EXTRA OFFER: 4 batteries in series (48 volts), $13.00. Pay Expressman after examining batteries, 5 per cent discount for cash in full with order. Send your order NOW and save $2.00.

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SAVE $2.00 BY ORDERING NOW!

you would in an ordinary regenerative set, but at the same time the radio frequency condensers should be kept about the same reading. Try loosening the coupling of the plate coil of the radio frequency tube, after a station is tuned in for varying results. There is an optimum position at which this coil should be left and its set screw tightened.

Super-Power

(*Continued from page* 41)

only after due notice to the supervisor of radio of the district, and must be at all times under the control and regulation of the supervisor and the Department.

2. Stations operating under experimental licenses may at the outset use a power input to the antenna not exceeding 1,500 watts. Whenever the radio supervisor of the district and the Department are satisfied that the public interest is served by the use of such increased power, and that no undue interference with other stations or with receiving sets results, its use may be continued. All applicants for such licenses must agree in advance they will reduce the power used during the course of the experimentation whenever the Department or the supervisor of radio deems such a course to be in the public interest and so directs.

3. If, as a result of the experimentation above specified, the use of the additional power is found to be in the public interest and the station desires to make a further increase, such increase will be allowed in successive steps of 500 watts, and experiments may be carried on at each of such increased stages, under the same conditions and restrictions as are above specified for the first increase.

4. The Department anticipates difficulty in laying down any general rule which will be of universal application to all such stations. It will therefore consider each station as a separate entity and deal with it according to the local conditions involved.

5. It is anticipated that the location of the station will be a factor of great importance, and that the amount of power that may be safely used will be in direct proportion to the distance of the station from congested receiving centers.

6. All such experimentation will be absolutely at the risk of the station conducting it, both as to location and power used, and notice is given in advance that these licenses will carry with them no permanent rights or privileges of any character, are entirely temporary and experimental in their nature, and are subject to withdrawal or revocation by the Department at any time in its absolute discretion.

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The "SELF ADJUSTING" Rheostat

$1.10 Everywhere

Write for FREE Hook-ups

AMPERITE controls perfectly and automatically the current flow from battery to tube. No Rheostat knobs on panel to turn. No ammeter needed. No worry. One AMPERITE for each tube inside the set regulates current on thermo-electric principle. Simplifies wiring and operation. Facilitates tuning. Proven in use. Adopted by 50 set manufacturers. Be sure your set is equipped with AMPERITE.

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"means right amperes"

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For tonal purity use B-METAL Crystals. Ask your dealer to order them.

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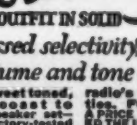
FIVE TUBE OUTFIT IN SOLID MAHOGANY

Unsurpassed selectivity, sensitivity, range, volume and tone combined

A beautiful sweet toned, five tube coast to coast* loud speaker set—factory-built, factory-tested and factory guaranteed by one of America's oldest and most reliable manufacturers of quality sets. Compound privacy set. Even a beginner can cut through the locals, get far-off programs loud and clear on the speaker. Log all stations and bring them in at will. Non-distorting, non-radiating, non-howling. Works on storage battery or dry cells.



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One tube guaranteed long distance outfit, $14.35. 2 tube guaranteed long distance loud speaker outfit, $29.50. Write for latest bulletins, testimony of users proving coast to coast reception. Order direct from this ad or

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Send free literature and full particulars.
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Address .....

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6. Soldered brass plates.
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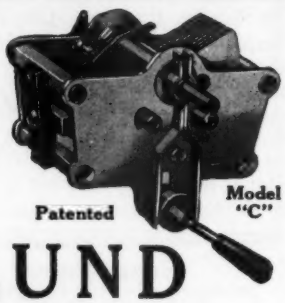
8. Takes any size dial.



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PERFECT FOR REFLEX

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The Rhythm of Life

(*Continued from page* 19)

I might attempt in describing the virile, spirited dash of artistry and genius combined. The notion of broadcasting a dance in terms of music appealed to me. Seeking the music critic of one of the large broadcast stations, I asked him if this could be done.

But my question was never answered, for the critic—bless his heart—has not recovered.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of the Wireless Age, published monthly at New York, N. Y., for October 1, 1924.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared H. H. Reber, who, having been duly sworn according to law, deposes and says that he is the Business Manager of The Wireless Age and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Wireless Press, Inc., 326 Broadway, N. Y. C.

Editor, None.

Managing Editor, C. S. Anderson, 326 Broadway, N. Y. C.

Business Manager, H. H. Reber, 326 Broadway, N. Y. C.

2. That the owner is: (If the publication is owned by an individual his name and address, or if owned by more than one individual the name and address of each, should be given below; if the publication is owned by a corporation the name of the corporation and the names and addresses of the stockholders owning or holding one per cent. or more of the total amount of stock should be given.)

Wireless Press, Inc., 326 Broadway, New York, N. Y.

Radio Corporation of America (owning all the stock of Wireless Press, Inc.), 233 Broadway, New York, N. Y.

The names and addresses of stockholders of Radio Corporation of America owning or holding 1 per cent. or more of the total amount of its stock are as follows: Cameron Blaikie & Co., 44 Broad St., N. Y. C., General Electric Co., 120 Broadway, N. Y. C., International Radio Tel. & Tel. Co., 150 Broadway, N. Y. C., United Fruit Co., 131 State St., Boston, Mass.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is.....
(This information is required from daily publications only.)

H. H. REBER,
Business Manager.

Sworn to and subscribed before me this 10th day of September, 1924 M. H. PAYNE,
[Seal.] Notary Public.
(My commission expires March 30, 1926.)

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(A Laminated Phenolic Condensation Material)

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Advertisers' Index

Adams-Morgan Co., Inc. 16
Allen-Bradley Co. 67
American Brand Corp. 70
American Elec. Co. 70
American Hard Rubber Co. 88
American Radio Mfg. Co. 78, 85
Andrea F. A. D. 5
Andrea & Sons Co., J. 90

Bakelite Corporation 82
Bel-Canto Mfg. Co. 96
B. Metal Refining Co. 93
Brandeis Corp., The J. F. 13
Brandes, C., Inc. 4
Branston, Inc., Chas. A. 64
Bremer-Tully Mfg. Co. 58
Bristol Co., The 57
Bunnell & Co., J. H. 82
Burgess Battery Company 91

Carter Radio Co. 58
Continental Fibre Co., The 95
Continental Radio & Elec. Corpn. 83
Copperweld Steel Co. 66
Crescent Radio Supply Co. 78
Crosley Radio Corp., The ....Third Cover
Cunningham, E. T. ....Second Cover
Cutler-Hammer Mfg. Co. 11

Daven Radio Co. 7
De Jur Products Co. 89
Dubilier Condenser and Radio Corp. 62, 78
DX Instrument Co. 64

Eby Mfg. Co., H. H. 64
Edson Radio Sales Co. 81
Eisemann Magneto Corp. 79
Electric Specialty Co. 74

Faraway Radio Co. 82
Federal Telephone & Telegraph Co. 83
Freshman Co., Inc., Chas. 76, 80, 88, 90
Fuetterer, W. E. 68

Garod Corp., The 87
General Instrument Co. 65
General Radio Co. 12
Golden-Leutz, Inc. 77
Goldschmidt Corp., The 78

Hammarlund Mfg. Co. 92
Heath Radio & Electric Mfg. Co. 84
Hull & Co., S. W. 95
Hyman & Co. Inc., Henry 66, 75

International Correspondence Schools 89

Jewell Elec. Instrument Co. 86
Jewett Radio & Phonograph Co. 59
Jones, Joseph W. 69

Kellogg Switchboard & Supply Co. 81
Kramer Co., Inc., G. 91

Lambert, Leon 85
Lego Corp. 68
Liberty Mail Order House 64, 80, 95
Lincoln Radio Corp. 88

Magnavox Co., The 73
Manhattan Elec. Supply Co. 71
Marie Engineering Co. 84
Marshall Electric Co. 91
Mellodyne Radio Co. 93
Mica Insulator Co. 72
Midwest Radio Corp. 93
Mozart Grand Co. 56
Mu-Rad Laboratories 9
Music Master Corp. 63
Mydar Radio Co. 60

National Carbon Co. 55
National Company, Inc. 76
National Radio Institute 90
Newman-Stern Co., The 94
New York Coil Co. 84

Omnigraph Mfg. Co., The 60
Ozarka, Inc. 80

Pacent Electric Co., Inc. 85
Perfection Radio Corp. 87
Phenix Radio Corp. 8
Polymet 90
Portable Globe Aerial Co. 80
Premier Electric Co. 76

Radiall Co. 93
Radio Assoc. of America 90
Radio Corporation of America ....15; Fourth Cover
Radio Corporation of America Distributors 92
Radio Institute of America 86
Rauland Mfg. Co. 61
Ithamstine, Thos. J. 85

Schwab, Inc., Harold M. 80
Shepard-Potter Co. 89
Small Ads of Big Interest 94
Southern Toy Co. Inc., The 87
Spaulding Fibre Co. 68
Sta-Rite Battery Co. 66
Standard Radio Co. 78

Thompson Mfg. Co. R. E. 3
Thordarson Electric Mfg. Co. 72
Tower Mfg. Corp., The 1
Turn-It Radio Sales 72

U. S. Tool Company, Inc. 93
Uncle Sam Elec. Co. 89

Valley Elec. Co. 90

Walbert Mfg. Co., The 84
Ware Radio Corp. 6
Western Coil & Electrical Co. 74
Westinghouse Elec. & Mfg. Co. 10
World Battery Company 93, 94

Zenith Radio Corp. 87

"Quality Goods for Quality Readers"

40 Ft. Mast in Yard

The HERCULES Aerial Mast

This Mast is made in sizes to get 20 ft., 40 ft. or 60 ft. clearance and is the answer to an efficient aerial system. This graceful Mast is an improvement to any property whether it is installed on the roof or in the yard. A pulley is furnished at the top for raising and lowering the antenna. All parts are made of steel and are light and strong. This Mast will safely stand a 500 pound pull at the top and support a 6 wire cage antenna. We furnish complete blueprint plans for erecting the Mast and it can be erected in a few minutes. It is shipped in sections for convenience in handling. The 20 ft. Mast weighs 40 pounds, the 40 ft. Mast weighs 100 pounds and the 60 ft. Mast weighs 200 pounds. Guy wires are spaced 120 degrees, or three equal spaces, 4 ft. from the base of the 20 ft. Mast, 8 ft. from the base of the 40 ft. Mast and 10 ft. from the base of the 60 ft. Mast.

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40 Ft. Mast . $25
60 Ft. Mast . $45

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S. W. HULL & CO., Dept. D1
2048 E. 79th ST., CLEVELAND, OHIO

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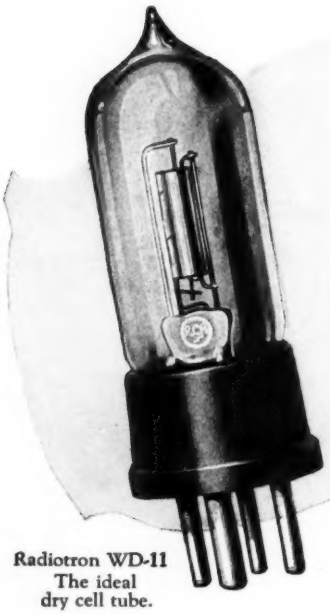

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